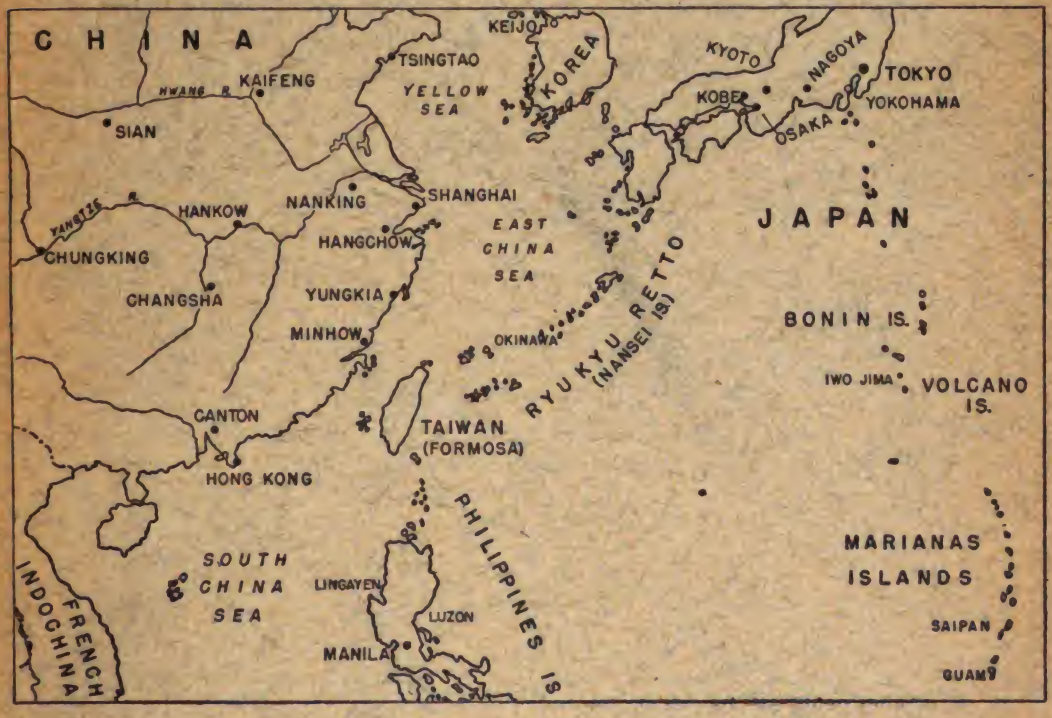
NUMBER 89 JUNE 1945

THE BULLETIN

OF THE

U. S. Army Medical Department

A periodical containing original articles, reviews, news, and abstracts of interest to the Medical Department of the Army



ISSUED UNDER THE AUSPICES OF
THE OFFICE OF THE SURGEON GENERAL

PUBLISHED MONTHLY AT THE MEDICAL FIELD SERVICE SCHOOL
CARLISLE BARRACKS, PENNSYLVANIA

By direction of the Secretary of War, the material contained herein is published as administrative information for the proper transaction of the public business and with the approval of the Director of the Budget.

NORMAN T. KIRK,
Major General, U. S. Army,
The Surgeon General.

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WAR DEPARTMENT,
OFFICE OF THE SURGEON GENERAL,
WASHINGTON 25, D. C.

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Foreword

With the October 1943 issue, The Bulletin became a monthly periodical, instead of a quarterly, dedicated to keeping the personnel of the Medical Department informed on developments in war medicine. The new publication, known as The Bulletin of the U. S. Army Medical Department, absorbed the former quarterly dental and veterinary bulletins and will have material devoted to those fields in each issue.

The Bulletin is intended to be educational rather than directive in nature. It will contain the best information obtainable concerning military medical experience, observations, and procedure that may help to improve further the quality of professional services. The Bulletin will be a medium whereby experience gained in one theater of combat may be shared with those serving in other combat areas and with those in this country who are preparing for overseas duty. News items concerning military and scientific developments as well as original articles will be emphasized. The Bulletin, however, should not serve as a basis for the forwarding of requisitions for equipment or supplies referred to therein.

Obviously, some of the most interesting field experiences cannot be divulged in a periodical of this kind when our country is at war. The Bulletin will, however, publish that which can be safely told, drawing not only on current literature, but on many authoritative reports which reach The Surgeon General's Office from the field. Officers are invited to submit for publication reports of their field experiences that can profitably be shared with other officers.

The Medical Department has been commended for its work in caring for the sick and wounded in theaters of operations in war. The Bulletin will endeavor to stimulate such progress and to advance further the high standard of medical service in the Army of the United States.

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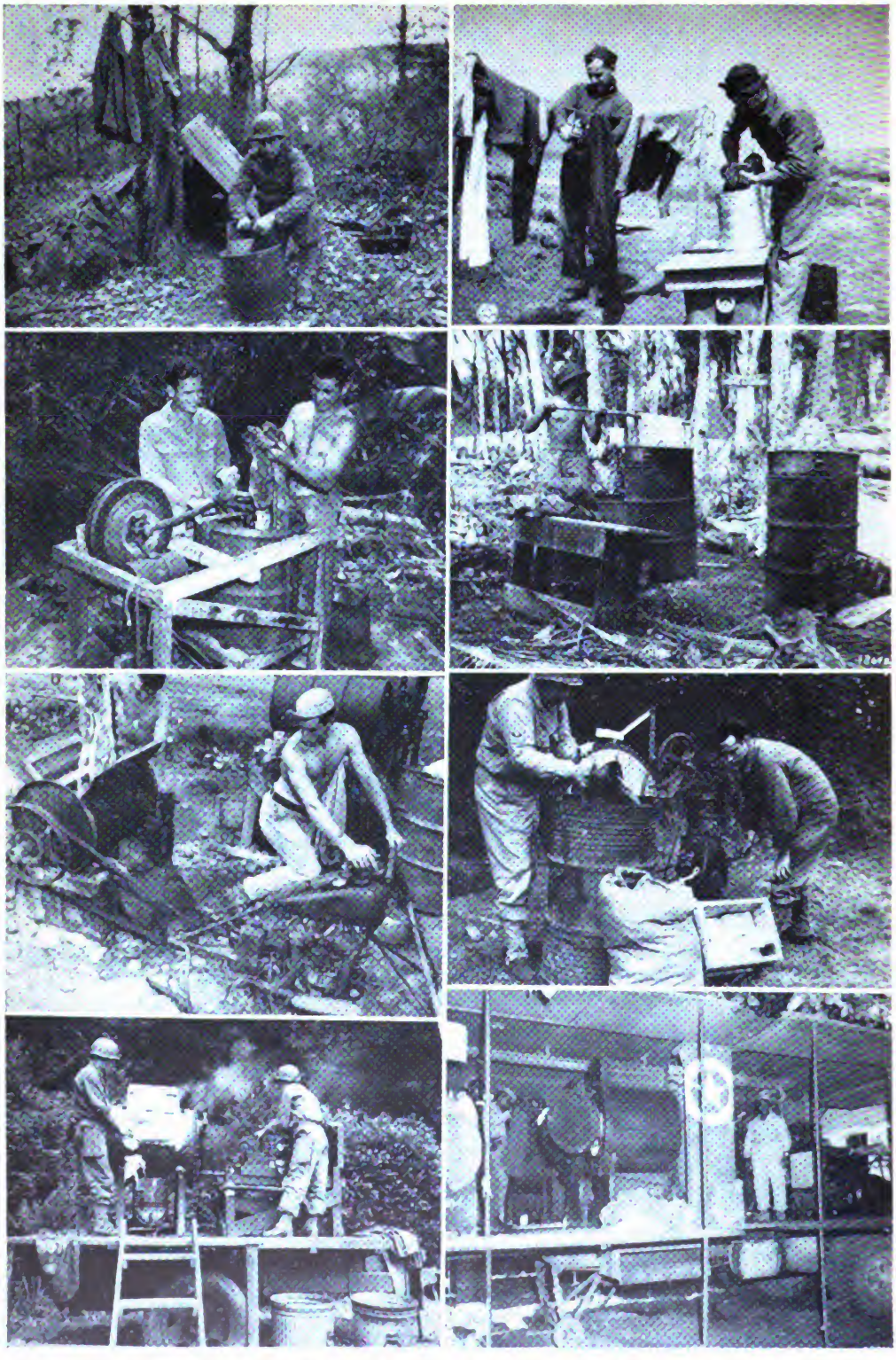


The determination of the American soldier to be cleanly is evident in these Signal Corps photographs of improvised and official laundry equipment. Top, left to right: (1) a soldier, a former school teacher, washes his clothes in France; (2) "noncoms" in Alaska; (3) in Bougainville; (4) at a South Pacific base; (5) washing machine made in New Guinea from a steel drum and an old motorcycle; (6) machine made in England from scrap; (7) machine made in France from captured German equipment; (8) a mobile quartermaster laundry unit in the Poligny area, France.

News and Comment

PARACHUTE SURGICAL TEAMS

Parachute surgical teams have been employed in the Southwest Pacific Theater of Operations, where the surgeon of an airborne division provided for training two teams, each consisting of two medical officers and eleven enlisted men. The medical officers had experience in jumping; the enlisted men had not. After two weeks' training in New Guinea all qualified to jump. The teams were equipped to do major surgery in the field. The weight of this equipment totaled no more than 400 lb. inasmuch as the necessity of some cross country travel on foot was anticipated. Among the items of equipment which are parachuted to each team are a basic set of surgical instruments with accessory neurosurgical, orthopedic, and genito-urinary sets. Towels, small sheets, dressings, rubber gloves, 6-in. rolls of plaster of paris, the regulation M.D. Chest No. 2, a single 21-in. sterilizer with a small stove, and materials for administering intravenous fluids, plasma, and whole blood complete the supply list.

Providing early surgery to casualties of an airborne unit is attended by difficulties. The first unit commanded by Captain McCleary embarked on its initial mission in December 1944. On landing, a bivouac area was established, and an operating room tent made of parachutes was set up. The first casualty, an abdominal wound caused by a hand grenade, arrived while they were putting up the tent. With the aid of a flashlight they arranged the equipment, constructed an operating table of tree boughs, sterilized the instruments over a gasoline stove, scrubbed, and prepared the patient for laparotomy, which eventuated in the closure of thirteen perforations of the small intestine. Ether anesthesia was used. The patient made an uneventful recovery and was evacuated fourteen days later. During the following twenty days, this group cared for 160 patients, 42 of whom were litter cases including 3 head wounds, 4 chest wounds, 2 abdominal wounds, and 18 compound fractures. Other litter cases presented simple fractures and soft-tissue wounds. The remaining 118 cases were ambulatory. Two patients died before operation could be undertaken.

The experience of this team has demonstrated the feasibility of using such groups with airborne troops. The difficulties encountered are no greater than those experienced by any isolated small unit performing major surgery. Despite limited equipment and supplies, medical attention can be provided to save patients who might otherwise be lost. The many compromises in this type of field surgery are more than offset by the rendition of prompt medical care.

THE BATTALION SURGEON

Medical officers serve in many different kinds of places and in various types of assignments, one of which is that of battalion surgeon. The Surgeon General's Office has a lot of sympathy for these young medical officers who are really saving lives but receiving little credit except from the men they serve. They are constantly in physical danger, and promotions are slow. They hear about the men in the rear hospitals doing professional work similar to that which they expect to do in civil life; but they go on, day by day, plowing through mud or sweltering in heat.

The Surgeon General has arranged for these officers to receive "on-the-job" refresher courses in the large hospitals when they return to the zone of the interior. The rotation of medical personnel between front and rear elements has been tried in some places, but it has a limited application. Inexperienced men sent forward are ineffective until they learn their jobs, and most of the men in the rear elements are assigned because of special medical skills, making their replacement difficult. The Surgeon General is well aware of all of these circumstances, and he has a sympathetic understanding of the position in which these men find themselves. He knows, too, that the excellent results of medical teamwork are in no small part due to the battalion surgeon.

A battalion surgeon directs "medics" in packing supplies to move to the front lines in E.T.O. Signal Corps photograph.

IMPORTANT ALTERATIONS IN ANESTHESIA MACHINES

It has been found that the McKesson anesthesia machines now in use in the Army develop a resistance to respiration amounting to as much as 9 cm. water pressure on both inspiration and expiration. Under these conditions, the danger of patients' developing respiratory fatigue, anoxia, and pulmonary edema is great. To eliminate this danger, a simple "fix-it" kit has been designed so these machines can be made perfectly safe by a few simple mechanical alterations. The replacement parts supplied in the kit will reduce the resistance to about 1 cm. of water pressure and will also permit much more efficient ether vaporization. The directions for use of this kit are presented in a War Department Modification Work Order dated March 1945 and listed as MWO Med 5.

All anesthetists using the anesthesia apparatus (Med. Dept. Items Nos. 3604000 and 9350000—McKesson models) should contact supply officers of their organizations promptly so as to read MWO Med 5 and make arrangements for effecting this important alteration in these machines at the earliest possible date.

WHOLE BLOOD—NEW REFRIGERATION SYSTEM

A new refrigeration system which prolongs the life of whole blood was inaugurated in shipments to the European Theater of Operations on 9 April. According to Brigadier General Fred W. Rankin, chief surgical consultant to The Surgeon General, with the new system whole blood will remain suitable for transfusions for twenty-one days instead of about sixteen days under the former method. Expendable iced containers, each holding twenty-four 1½-pint bottles, have been developed to keep the blood at not below 39° nor above 50° F. The container and the twenty-four bottles of blood weigh 105 pounds.

The new system was inaugurated at New York and Washington, D. C. About 1,200 pints of whole blood a day will be flown to Europe, where an elaborate system has been set up to complete delivery to forward areas. Blood-bank detachments at focal points will service all communications zone medical

Packing whole blood in the new container for shipment at New York Whole Blood Center.

installations in the area and send blood farther forward by truck to detachments which will deliver it to the operating surgeons. The use of whole blood and plasma is regarded as the greatest single improvement over the medical techniques of World War I. It is so vital in saving lives that anything that extends its use is of prime importance.

Combined figures on East and West Coast flights of whole blood to the war theaters reached 257,378 pints to 7 April 1945. Since the start of the blood-flying program over the Atlantic last August, 180,473 pints of whole blood have been flown from the East Coast to the European Theater. This service has made it possible for a wounded man to get blood within twenty-four hours after it was drawn from a donor in the United States. Whole blood shipments being flown from the West Coast to the Pacific Ocean Area have totaled 76,905 pints from the inauguration of the service last November to 7 April 1945.

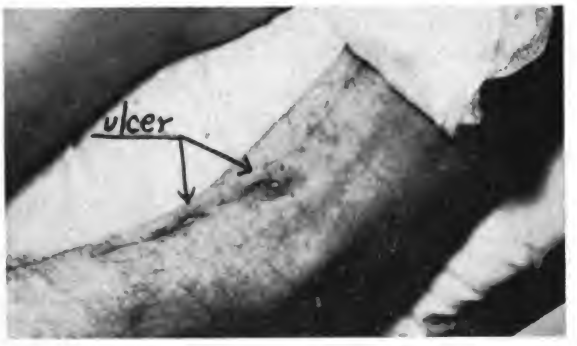
Continued donations of type "O" whole blood by civilians are necessary to maintain this lifesaving service. A report from the Southwest Pacific contains the following note on the use of whole blood:

> Eight hundred units of whole blood received from the United States were used in the hospitals of one army from 1 December to 25 December. The blood was received and cared for by the medical supply depot. As suggested by the special representative on plasma and blood transfusions from The Surgeon General's Office, the care of the blood was made the responsibility of one medical officer. From this depot, the blood was obtained by various medical units. The ease with which it may be given, the low incidence of reaction, and the insistence that more blood be used led to a marked increase in its consumption. Use of whole blood was not limited to the immediate pre- and postoperative phases of the surgical procedure, but was employed later as indicated. The results have been gratifying.

INCISIONS ACROSS THE KNEE JOINT

Convalescent hospitals afford an excellent opportunity to observe the end results of various technical approaches to surgical problems. The importance of the proper type of incision for exposure of the posterior structures of the knee and of placing incisions parallel to instead of across the flexion creases is illustrated in recent cases observed by Lieut. Colonel Robert W. McCullough, M.C. Figure 1 shows the residual scar following incision last October for an elective operation. The incision was placed on the posterior aspect of the knee joint at a right angle to the flexion crease. Primary healing followed; however, despite prolonged local protection and treatment, keloid formed at the level of the flexion crease with repeated ulceration even under restricted activity. Five and one-half months following surgery, it was necessary to return the patient to a plastic center for additional surgery.

In a second case of elective surgery performed last August through an original wound caused by machine-gun fire, the incision crossed the joint, not on the flexion crease, but at the center of rotation of the joint, so that the stress on the scar was rotary, rather than the longitudinal stress of extension present in the first case. Primary healing followed surgery. Again, despite prolonged care, there was definite exuberant scar formation at the joint level. Seven months after surgery, because of repeated ulceration of the scar, this patient was transferred to a plastic surgical center for further surgery. In both cases, the ulceration in the scar was superficial and there was no foreign body to account for the poor healing. In each case, that portion of the scar above and below the joint line healed normally, and scars of previous lacerations elsewhere on the body healed without evidence of keloid formation. In contrast to the incisions in these cases, incisions that have been placed parallel to the flexion crease have remained healed and pliable without keloid formation or stress during extension of the knee. Where it is necessary, the transverse incision can be extended in a curved line, above or below the joint. Such cases can participate in the convalescent training program, and disposition is not delayed.



These comments represent established surgical principles which have been observed, especially in hand surgery. The protracted convalescence and further reconstructive surgery required in the two cases cited emphasize the need for greater care in incisions over joints, particularly the knee.

A section of the 167th General Hospital in France, showing the new "T" type surgical hut in the foreground. This includes wards, clinics, administration, and billet area. Signal Corps photograph.

COMMITTEE ON PROSTHETIC DEVICES

On request of The Surgeon General, a study of problems associated with providing war veterans with artificial limbs has been initiated by the National Academy of Sciences and the National Research Council through a Committee on Prosthetic Devices, the chairman of which is Dr. Paul E. Klopsteg, professor of applied science at Northwestern University. The committee will represent jointly the Division of Engineering and Industrial Research and the Division of Medical Sciences of the Council, and its activities are supported by the Office of Scientific Research and Development through the Committee on Medical Research.

The intention of the committee is to consider the problems from the points of view of engineering, production, fitting, and servicing, and from their medical and surgical aspects. Its purpose is to make certain that veterans will be provided with the best possible prosthetic appliances that can be devised. The committee will analyze objectively every meritorious device. New developments will begin on the foundation of experience already available, as manifested in the ingenious mechanisms now in use and in the success that has been achieved in the fitting and use of limbs by military and civilian personnel. The committee will aim also to bring about as much standardization as possible in parts and mechanisms in order to simplify maintenance and repair. To assure the utmost utility and practicality of any developments under its auspices, the committee is establishing close relationships with Government amputation centers in hospitals of the armed forces. Dr. Charles F. Kettering, head of General Motors Research Division, and Dr. Roy D. McClure, chief surgeon of Henry Ford Hospital, Detroit, are consultants to the committee, the operating headquarters of which are at Northwestern University, Evanston, Illinois.

VINCENT'S STOMATITIS

Vincent's stomatitis, trench mouth, has not been a serious problem during this war. Although a gradual rise in the rate of admission in the United States has occurred since early 1942, with a peak of 5.2 per 1,000 per month for August 1944, the rates consistently have been below the level which might be expected.

A sharp rise in the overseas rates for Vincent's stomatitis occurred during March and April 1943; however, the rates have remained fairly constant—under 3 per 1,000 per month. The incidence overseas generally has been higher in areas where troops have been in relatively close contact with civilians. There has been little relationship between the frequency of Vincent's stomatitis and combat.

MECHANICAL RETRACTOR FOR HEMILAMINECTOMY

Hemilaminectomy exploration of the spinal canal has become a fixed technique of neurosurgery. This is particularly true with specific pantopaque localization of herniated nucleus pulposus. While an adequate retractor for muscle retraction in the procedure of inter-lamina exploration of lumbar roots is not supplied, Major Charles L. Neill, M.C., reports that a suitable retractor can be easily devised by remodeling a Frazier retractor (a standard issue item) to form an entirely different retractor.

FIGURE 1

The Frazier retractor consists of two rake blades adjustable on a crossbar. The blades are semicircular in shape. This retractor is not suited for fixed retraction in unilateral exploration procedures of the spinal canal.

To make it suitable, the three-toothed rake blade is heated over a Bunsen burner, and the blades are bent around until they are curved (figure 1). The middle blade may be removed if desired. One-half of the blades are filed away and sharpened. The opposite four-toothed blade is partially straightened so that its retractor depth is increased.

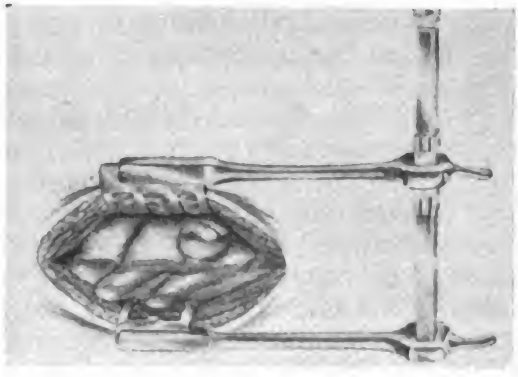


FIGURE 2

The muscles are stripped subperiosteally and cut away from the spinous process. The retractor is introduced so the short, sharp rake catches on the fascia overlying the spinous process. The deep blade reaches down to the lamina and, as the retractor spreads, gives adequate exposure. Hemostasis is accomplished from this pressure. The shape of the large blade should be altered without heat to retain the temper of the metal.

SCARCITY OF BISMUTH SALTS

The supply of bismuth and its compounds continues exceedingly critical; therefore, it is increasingly imperative that the use of bismuth salts be restricted to that most essential for the maintenance of health and the treatment of the most serious diseases. It is desired that all medical officers, because of this critical situation, continue to limit the use of bismuth salts to situations in which they are absolutely essential.

JOINT POLICY ON DDT FOR MOSQUITO CONTROL IN UNITED STATES

The successful use of DDT to combat insect-borne disease among our troops overseas has made this potent war-developed insect killer renowned. Dramatic reports of its large-scale use to control epidemics have fostered the hasty conclusion that DDT is a complete solution to all insect-borne disease problems. However, it must be remembered that DDT distributed over the countryside not only wipes out malaria-carrying mosquitoes but may also kill other insects, many of which are beneficial. Much must be learned about the effect of DDT on the balance of nature important to agriculture and wild life before its general outdoor application can be safely employed in this country. It may be necessary to ignore these considerations in war areas where the health of our fighting men is at stake, but in the United States such considerations cannot be neglected.

Extensive investigations are now being made by authorized agencies to determine the usefulness and possible hazards in the large-scale dissemination of DDT. Until more information has been obtained from such investigations and until it has been evaluated by all interested parties, plans to employ DDT indiscriminately for outdoor area control of insect disease vectors in this country are not to be encouraged.

Since the beginning of mobilization the Army has carried on an antimosquito campaign inside military reservations, and the U. S. Public Health Service has maintained a cooperative program for the control of malaria in adjacent extra-military areas. This joint effort has successfully prevented malaria from becoming a problem to troops in this country. To meet the hazard of possible spread of malaria by troops returning from overseas, the Army's program in military areas has been intensified and the program of the U. S. Public Health Service extended to include certain additional selected areas in the south where risk of transmission is greatest. Representatives of the Army and the U. S. Public Health Service have given full consideration to ways in which this mosquito control program might be strengthened by employing DDT. The following joint policy has been agreed on pending acquisition of further knowledge.

1. DDT will be used for residual spray application to houses and other buildings for the purpose of killing adult mosquitoes before they have opportunity to transmit malaria. The long-lasting killing effect of DDT as a residual spray provides a highly effective means to prevent the spread of the malarial parasite. This method of use is safe and economical, and, moreover, is welcomed by the householder because it provides freedom from insect annoyance.

2. The use of DDT as a mosquito larvicide will be limited to experimental investigations and to situations where DDT

has definite advantage over other larvicides in saving materials and manpower, and where it presents no hazard to fish and other wild life.

3. Distribution of DDT from aircraft for large-scale area control of mosquitoes in military and adjacent areas in the United States will be limited to projects conducted with due regard to the possible effects of DDT on beneficial insects and all forms of plant and animal life, and in accordance with safeguards established by The Surgeons General of the Army and the U. S. Public Health Service.

TYPHUS, CHOLERA, PLAGUE, AND YELLOW FEVER VACCINES

The issue of typhus, cholera, plague, and yellow fever vaccines to installations in the United States is restricted in order to prevent waste of these items which are produced in limited quantities by biological manufacturers. Typhus and cholera vaccines are issued, on requisition, to named general, regional, and 750-bed or larger station hospitals; ports of embarkation; staging areas; general dispensaries; overseas replacement depots; and all stations of the Army Air Forces. Because of production limitations and limited requirements for yellow fever and plague vaccines in the zone of the interior, their issue in the United States is further restricted to ports of embarkation, staging areas, general dispensaries, overseas replacement depots, six geographically selected hospitals, and stations of the Army Air Forces. Air Forces policy is to maintain stocks of these vaccines constantly in A.A.F. regional and convalescent hospitals only, but the vaccines are issued on order to any A.A.F. installation. The Kansas City Medical Depot is authorized to issue any of these vaccines to any station where casuals or units are under overseas movement orders which require their immediate immunization and such facts are stated as the basis for the requisition. However, stations other than those listed above are prohibited from stocking and maintaining supplies of these vaccines.

To prevent unnecessary delay in movement of casuals or small groups ordered overseas by air, the movement orders specify that the required special immunizations will be obtained immediately. Furthermore, to prevent delay in aerial ports of embarkation while awaiting completion of immunization, a pending revision of POR will require the completion of these special immunizations before arrival at such ports. It will further provide that special immunizations, which are not given at home stations, will be administered at or by the nearest available facility at which they are obtainable. On receipt of orders requiring immediate special immunizations at stations where these vaccines are not stocked, a decision must be made in each case whether to send the individual to the nearest facility where the vaccine is available or to request

the vaccine to be sent either from the Kansas City Medical Depot or the nearest facility, with complete justification for the request.

Some waste of yellow fever vaccine is unavoidable for several reasons. Because of technical difficulties, the minimum size ampule practicable to produce is 1.0 cc. (20 doses). Unused portions must be discarded one hour after dilution, and it is occasionally necessary for reasons of military urgency to immunize small groups or even only one person at a time.

NEW METHYL BROMIDE FUMIGATION CHAMBERS

A limited number of all-steel fumigation chambers are being built according to Quartermaster Specifications J.C.D. No. 1044, 15 January 1945. These chambers are manufactured for the purpose of indoor installation and are intended for named general hospitals, some station hospitals of a more permanent nature, and for ports of embarkation in continental United States. They may be had on requisition to the Office of The Quartermaster General, all requests being subject to review by the Office of The Surgeon General. Each requisition will be carefully considered, and unless ample justification for the need is shown the requisition cannot be honored.

This excellent fumigation chamber is about 330 cubic feet in size, has a lift-up full end door which is easily manipulated, having centrally operated fasteners. It will be shipped to the hospital as a complete unit. Each chamber will be furnished with a truck and where units of two or more chambers are furnished an extra truck will be supplied. The trucks are completely fabricated with all joints and sections welded. These sections will come "knocked-down" but may be easily assembled with bolts. The truck has a capacity of 3,000 pounds.

These chambers may be used to fumigate clothing, bedding, overstuffed furniture, or even certain food items which may become infested with stored-product insects such as the tobacco beetle, drugstore beetle, carpet beetle, clothes moths, larder beetles, cheese skipper, grain weevil, rice weevil, flour beetles, meal worms, cadelle weevils, grain moths, flour moths, pea weevils, bean weevils, and others. Methyl bromide in high concentrations is also toxic to humans. Attention is invited to War Department Circular No. 374, 14 September 1944, and Transportation Circular 35-7.

Smaller hospitals may use Bag, delousing, and 20-cc. methyl bromide ampules for fumigation of small items. These may be obtained by requisition to the Office of The Quartermaster General, subject to the approval of The Surgeon General's Office.

SCRUB TYPHUS IN THE SOLOMON ISLANDS

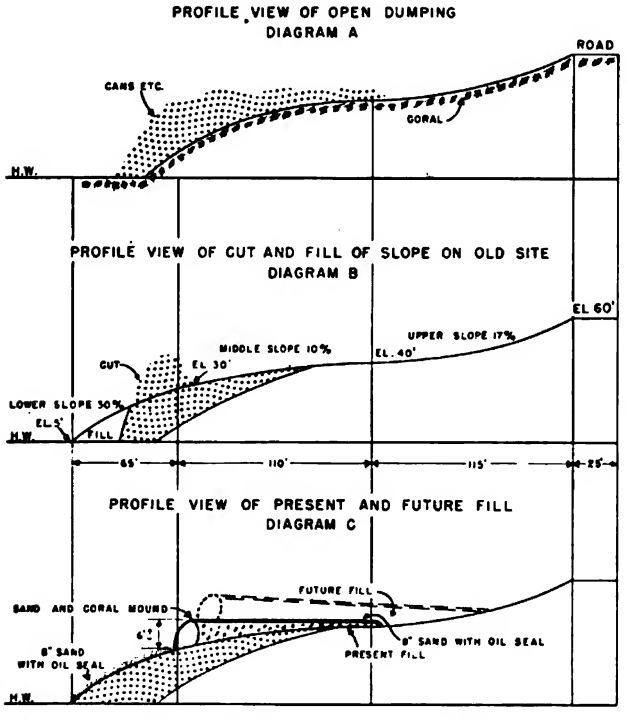
A report has been received of 49 cases of scrub typhus in the Northern Solomon Islands on an island which had been reported as being free from this disease. In May of last year, some hundreds of soldiers landed on a beach in enemy territory where dense jungle and swamp approached to within 40 feet of the shore. Nearly 200 of these soldiers remained for two nights on this beachhead and scrub typhus did not develop in any of them, although they joined the rest of the force some three days later and operated with them for a week thereafter. More than 700 men separated from the first group and bivouacked a mile away at the mouth of a river where a meadow of coarse grass extended from the river bank back to the jungle, which site had been that of a native village and later a bivouac area for Japanese soldiers. Most of this group suffered from chigger bites on the legs. They did not use repellent during the first night, and only irregularly during subsequent days on patrol. Clothes were not impregnated with dimethyl phthalate or other miticides. About two weeks after the three-day exposure in this area, the 49 cases reported were admitted to hospital. No cases of scrub typhus had previously developed in this unit. All the patients in this series of cases were Melanesians, except one who was a European. This localized epidemic was a mild form of scrub typhus. Most of the early cases were admitted with a tentative diagnosis of malaria and several were originally thought to be dengue.

Abstract of a paper by Majors Walter L. Anderson and Wilson M. Wing, M.C., A.U.S., submitted to The Surgeon General's Office.

Field Artillery pack battalion in Australia. Signal Corps photograph.

SANITARY FILL ON THE ISLAND OF EFATE

By clever adaptation of the sanitary fill principle, a highly unsanitary garbage dump on the island of Efate, New Hebrides, has been converted into a sanitary fill. An open dump area between a lagoon and the main road into the town of Vila was unsightly and hazardous. Flies and mosquitoes swarmed about this area, and a night survey showed nearly a thousand rats on the dump. American troop units were on duty within a short distance of the area. The site was not the most favorable for a sanitary fill, as there was a sharp slope from the road to the edge of the lagoon, and underneath the six inches of top soil was a hard coral.



Diagrams showing development of the sanitary fill.

In developing the sanitary fill, the whole dump area was covered with from 6 to 8 inches of coral aggregate and sand, to retain which a 30 percent slope was formed on three sides. On the top edge of the slope, sand and coral aggregate were piled in a mound 5 to 7 feet high around three sides, thus holding intact any lateral thrust that the debris might make. The sand and coral were obtained from stock piles on the site which were built up once a month. Dumping was started at a point on the upper slope so that when the fill was built out level it met the top of the sand mound. A coating of oil is put on top of the garbage and 6 to 8 inches of coral and sand on top of the oil seal. At the end of the day all the garbage, including sloping sides of refuse, would be covered in this way.

A place was maintained on the site for burning boxes and cardboard, which, however, was kept at a minimum by requiring all units in the area to have an incinerator and to take only nonburnable material to the sanitary fill. Some units, however, took burnable material to the sanitary fill site for burning.

The settling of the fill was slight. Most of the cans were

Abstract of report to Sanitary Engineering Division, The Surgeon General's Office.
Signal Corps photographs.

flattened and bottles broken before arriving at the sanitary fill. Broken glass bottles were used to fill the voids in the can pile and edible garbage sometimes was used to fill voids in the broken glass. The oil seal and 6 to 8 inches of sand and coral were placed on top of this fill. Dumping was started at a point on the upper slope so that when the fill was built out level it met the top of the sand mound. A crew of eight natives and one soldier with wheelbarrows and tools maintained the sanitary fill.

FIGURE 1. Sanitary fill site showing garbage being dumped, which in turn will be covered with sand and coral

FIGURE 2. Side view of covered garbage layer being built out level. Native is spraying garbage with oil.

FIGURE 3. Registration of name, unit, and kind of garbage is made on entrance to sanitary fill.

This adaptation of the sanitary fill principle varied from the conventional procedures in that (1) sloping terrain was used instead of relatively level terrain; this instance, however, eliminated a need for excavation but necessitated hauling in material for coverage which ordinarily is obtained from excavation dirt; (2) 6 to 8 inches of sand and coral were used for coverage daily instead of 2 feet or more of earth; (3) garbage was covered daily with oil.

This sanitary fill eliminated the mosquitoes and rats, flies were reduced to a minimum, and the appearance of the site along the road into town was greatly improved.

CHLORINATION OF WATER TO DESTROY SCHISTOSOMA JAPONICUM CERCARIAE

The National Institute of Health has made studies on *Schistosoma japonicum* cercariae obtained from infected snails imported from the Philippines to determine the concentration of chlorine required to destroy these infective organisms. The results of the studies with *japonicum* cercariae were comparable with those previously obtained with cercariae of *S. mansoni.* Thus, in endemic areas, application of sufficient chlorine to water used for bathing, drinking, or laundry purposes to provide one part per million residual at the end of thirty minutes' contact affords protection against *S. japonicum* cercariae as well as against those of *S. mansoni,* as reported in the March 1945 *Bulletin,* page 23.

VITAMIN C IN TREATMENT OF TROPICAL ULCER

Tropical ulcers occur infrequently in American soldiers in New Guinea and much more frequently in the natives. The ulcers usually develop following a scratch, bruise, cut, burn, or other superficial injury. They spread and become difficult to check for weeks or months.

Captain George E. Brown, M.C., in fourteen months with an Air Forces unit in the New Guinea jungles, observed only three tropical ulcers. The first two had been under local treatment about four months and were about 1½ cm. and 2 cm. in diameter, respectively. Local treatment was continued for another month with little improvement. At this time observations were being made on soldiers showing characteristics thought attributable to subclinical avitaminosis C. Wounds healed very slowly and had a marked tendency to become infected. Realizing the important part played in epithelization by vitamin C, it was decided to inject large doses intramuscularly into the patient with ulcer. Intramuscular injections of 200 mg. of cevitamic acid were made every other day for two weeks. Improvement began immediately and within ten days complete epithelization occurred in each case. During the vitamin C treatment, the same local treatment as had been used was continued.

No further cases were observed for twelve months, when an officer returned from Australia with a burned area on the left leg. He developed dengue and was sent to the hospital. In the meantime the burned area had broken down into two ulcers, both about one inch in diameter. He was kept in hospital about two weeks. Zinc oxide was applied, and he was given bed rest with the affected leg elevated. The ulcers became worse. He was returned to the squadron for ambulatory treatment, and daily injections of 200 mg. of cevitamic acid were started. Improvement was noticed overnight. On the twelfth day both ulcers were entirely covered by epithelium. The local treatment consisted of bathing the ulcers with diazochloramid daily for the first week. Plain petrolatum gauze dressings were applied.

To find more ulcers, the Netherlands Indies Civil Administration Hospital was visited. A Chinese doctor, educated at the University of Hong Kong, reported that tropical ulcers in the natives were being treated by local applications of zinc oxide and by a diet rich in protein and vitamins. The natives were given one-half cup of citrus juice daily. This treatment effected cures within six weeks to three or four months.

Our diet here in the jungles, which is lacking in fresh fruits and vegetables, may lack sufficient vitamin C to effect rapid epithelization. It is an observed fact that wounds heal more slowly here than in the United States.

An abstract.

NEW FUNGICIDAL OINTMENT

Undecylenic acid ointment, one of the fatty acid preparations for the treatment of superficial fungous diseases of the skin, has been standardized and is in progress of procurement and distribution. It is now being sent to overseas theaters, and when their initial requirements are filled it will be distributed to all installations in the zone of the interior. Announcement of availability will be made by medical supply distribution depots. This new preparation is packed in 1-ounce tubes, and labeled Ointment, fungicidal (Med. Dept. Item No. 1322050).

It is anticipated that this new fungicidal ointment will be a useful addition to the therapeutic armamentarium for superficial cutaneous mycoses. Extensive studies on a large group of patients, sponsored by the National Research Council, have indicated that this type of preparation is probably the best single method of treatment for the average case of dermatophytosis. The results in the treatment of tinea cruris and tinea corporis are perhaps less striking. The drug has an advantage in that it is seldom irritating; although irritation does occur, particularly in the groin, and, in this event, it must be discontinued.

This preparation is not as effective as other measures for the treatment of pyogenic dermatitis; therefore, if the fungous disease is complicated by secondary bacterial infection, this factor should be treated (1:9,000 potassium permanganate soaks, used for one-half hour four times daily is one method of treatment which is usually effective) before undecylenic acid ointment is used for the underlying mycotic infection.

Directions for Use

For feet. Apply nightly between the toes and on the soles of feet, using ¼ to ½ teaspoonful. Wash or wipe off in morning and apply G.I. foot powder. Use persistently for several weeks after skin clears. The ointment should not be used during the day if the patient's duties necessitate prolonged walking or marching, because this tends to macerate the skin; but it can be applied during the day if he is not on active duty or on his feet much of the time.

For body, legs, and arms. Apply thin coating of ointment over eruption every night and morning.

For groin. Apply thin coating of ointment over eruption and surrounding skin every night. Wipe off in morning and apply talcum if patient is on active duty; if he is not on active duty, the ointment can be applied night and morning.

Dental Personnel in Southwest Pacific Area.—During the last quarter of 1944, about one dental officer to every 830 troops was present in the theater. As of 1 January 1945, 109 dental officers had been evacuated to the United States for physical reasons, 70 had been returned under the rotation policy, 2 had been released from active duty, 2 had been killed in action, and 2 were missing on noncombat missions.

DDT FOR THE CONTROL OF ROACHES

As indicated in the March issue of *The Bulletin*, there are three types of DDT which may be used for the control of roaches. Information regarding the use of these insecticides for the control of this pest follows:

Quartermaster Stock No. 51-L-122, Larvicide, DDT, powder, dusting, (Formula: 10 percent DDT in talc; finished product when used against roaches).

Application and effect. The dust may be applied lightly in mess halls and kitchens with an ordinary hand-operated dust gun. The quartermaster supplies, for this purpose, Duster, insect powder, plunger type, Stock No. 41-D-3750. Not more than 10 pounds of powder is necessary to treat the longest mess hall. For best results the material must be dusted under serving tables, sinks, cupboards, refrigerators, around water pipes and hot water tanks, into cracks and crevices in the wall, under moldings, and other places where roaches hide or run. Cover food, cooking and eating utensils, and table tops during dusting procedure. The principal disadvantage to its use in mess halls is that, common to all insecticide powders, it has an unsightly appearance. Insecticide, spray, DDT, residual effect, being liquid, is preferable for roach control. By using the latter, one-half the amount of DDT is required; the insecticide is removed less readily in cleaning; and spraying for control of flies and other insects as well can be accomplished in a single operation. The dust method is apparently equal to sodium fluoride in effectiveness and is more effective against the German roach than is DDT residual spray.

Quartermaster Stock No. 51-I-305: Insecticide, spray, DDT, residual effect (Formula: 5 percent DDT in refined kerosene; finished product).

Application and effect. The residual spray when used to control roaches is applied by ordinary hand sprayers or power sprayers to such resting and hiding places as previously described. In general, roaches appear to prefer places where there is some warmth, but they will hide behind any object which will shield them from light. Areas treated should be well coated with the spray to ensure maximum contact between the roaches and the spray residue. Before spraying, precautions should be taken to prevent contamination of food and mess equipment, and all fires should be banked or extinguished. Spraying for flies and cockroaches in one combined operation is the most practical and economical method of using the residual spray. It is best to arrange to do the spraying after the evening meal, as it will take several hours to air out the mess hall.

A thorough application, while not so rapid in initial results, is highly effective and will give protection for several weeks or more. The duration of the effect will depend to some degree on how quickly the residue is removed by the daily cleaning of the mess hall. The floor areas that are scrubbed daily will require more frequent spraying than walls and shelves which are washed less frequently. It will be found that the German cockroach (*Blatella germanica*) is somewhat more resistant to DDT in any form than the American cockroach (*Periplaneta americana*), and an increase in dosage over 200 mg. DDT per square foot when applying the residual spray may be necessary to effect its control.

Some have complained that DDT residual spray, when made up locally using a thick oil and applied to window screens, cuts out air circulation; therefore, when painting or spraying window screens it is best to use the finished product Q.M. No. 51-I-305 to avoid reducing air circulation.

Quartermaster Stock No. 51-I-169: Insecticide, liquid, finished spray (Formula: 1 percent DDT and 2½ percent thanite in refined kerosene; fin-

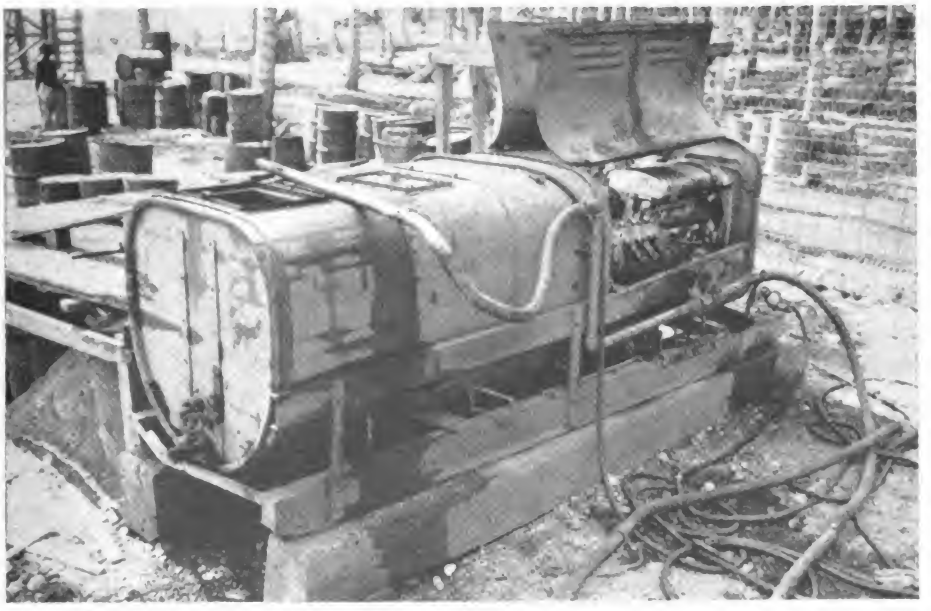
ished product). This item is the general utility spray issued in the past for use against all types of insects. Present stocks in the field consist of 5 percent thanite and 95 percent kerosene. These can readily be converted into the new formula by adding an equal amount of kerosene and then 1 percent DDT to the total. The label should be changed to indicate the DDT content. It is apparent that present stocks can be doubled thereby.

Application and effect. The spray is applied with the ordinary flit-gun type of hand sprayer. The quartermaster issues for this purpose Sprayer, liquid, insect, pump-type (Stock No. 41-2-4110 to 12). In dispensing the spray it should be sprayed direct on the insects to be killed. No special precautions need be taken other than those which will exclude the gross contamination of food. The effectiveness of this item against insects, particularly flies and mosquitoes, has been enhanced by the addition of DDT, and the percentage of kill is greater than with the old formula. Information is limited on its effectiveness against roaches. After repeated use there may be sufficient DDT deposited on surfaces to obtain a slight residual action, but its application with this in mind would be wasteful.

CELLULITIS AND OSTEOMYELITIS

Cellulitis resulting from dental infection has been slightly more frequent among overseas troops during 1943 and 1944 than among troops in continental United States. After a rise to a peak of 24 per 100,000 men per month in April 1944, the overseas rate has declined again to about that for continental United States, which has ranged from 13 to 18 per 100,000 men per month.

The rate for osteomyelitis has been low throughout the war, ranging from 0.005 to 0.008 per 1,000 men per month.



DDT is producing excellent results when properly mixed and applied. This machine is used for making stock bulk amounts of the insecticide. August 1944. Signal Corps photograph.

DISTRIBUTING CENTER FOR PARASITOLOGICAL SPECIMENS

The necessity for a central distributing point for parasitological specimens for teaching purposes was recognized by the Association of American Medical Colleges, which appointed a committee to confer with representatives of the Army and the U. S. Public Health Service. It was decided to use the Division of Parasitology of the Army Medical School as such a point, since that division was already engaged in collecting and distributing materials to schools of the Medical Department of the Army. A brief summary of the activities of the center from the time of its inception in January 1943 to the end of 1944 has been prepared by Major George W. Hunter, III, Sn.C. A total of 114,989 items was received during that period and a total of 107,882 items was produced, reconditioned, and/or redistributed at the Army Medical School. Some specimens received could not be reconditioned and had to be discarded. Some of the excess represents stock already on hand.

Contributors and recipients of parasitological material

	Contributors		Recipients	
	1943	1944	1943	1944
Civilian institutions	59	28	113	104
Public Health laboratories	9	7	12	13
Military	34	30	205	114

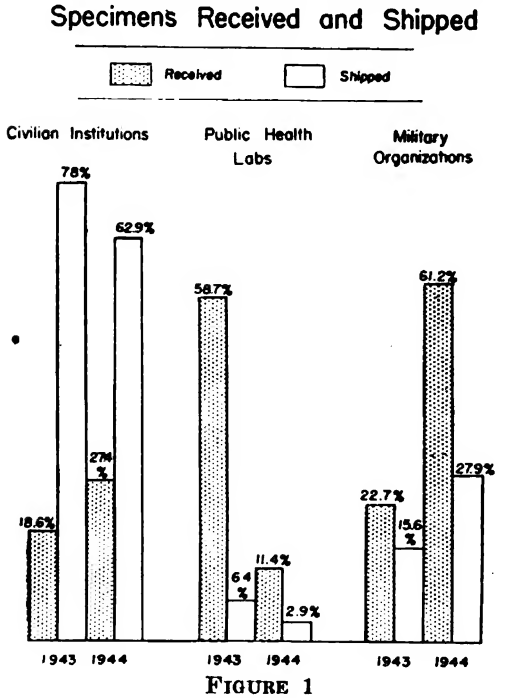


FIGURE 1

The different groups of organizations donating and receiving material are shown in the table. The types of material furnished included: protozoan cultures; entomological specimens; infected animals; feces containing cysts and ova; blood smears—malaria, filariasis, leishmaniasis, and others; impression films of *Toxoplasma* and others; permanent mounts (cysts and ova); and information concerning sources of parasitological material, motion picture films, and techniques. The volume of material received from and shipped to the different groups is summarized in figure 1. Many institutions and agencies have cooperated in this venture and any success achieved is due to their cooperation. It is hoped that the Distributing Center will be more useful during 1945 through the support of an even greater number of cooperating institutions and agencies.

HOSPITAL FOR TREATMENT OF TROPICAL DISEASES

Harmon General Hospital, Longview, Texas, recently was designated to receive patients requiring specialized treatment for tropical diseases. Moore General Hospital, Swannanoa, North Carolina, has been already so designated (*The Bulletin*, October 1944, page 10). At these two hospitals, medical and laboratory officers with specialized knowledge are stationed and necessary facilities are available for diagnostic studies and therapeutic measures in this field. Both installations conduct necessary laboratory and clinical investigations in order to improve the diagnosis and treatment of poorly understood diseases, and special reconditioning programs are in effect for patients convalescing from such diseases as malaria and filariasis. In general, patients whose homes are in the western part of the country will go to the Harmon General Hospital, while those who live in the East will go to the Moore General Hospital. The commanding officer of Harmon is Colonel Gouverneur V. Emerson; Lieut. Colonel Worth Daniels is chief of the medical service, and Lieut. Colonel Stuart W. Lippincott is chief of the laboratory service. Investigative studies will be supervised by the Medical Consultants Division of The Surgeon General's Office.

QUININE DIHYDROCHLORIDE FOR INTRAVENOUS INJECTION

Certain lots of Medical Department Item No. 1389000, Quinine dihydrochloride, 12 ampules: NF; 1-cc. ampule containing 5-grain solution, are labeled "For intramuscular injection." Such lots are also suitable for intravenous injection, provided the drug is administered in adequate dilution. Attention is directed to the recommendations of paragraph 4*b*(2) War Department Technical Bulletin TB MED 72, 10 July 1944, which specify that doses of quinine dihydrochloride given intravenously should be diluted to at least 200 cc. with sterile physiologic saline solution and injected slowly.

BENZYL BENZOATE FOR TREATMENT OF SCABIES

This preparation which has been standardized as Benzyl benzoate concentrate emulsion (Med. Dept. Item No. 1100100) is in process of procurement and distribution and is now being sent to overseas theaters. When their initial requirements are filled, it will be distributed to all installations in the zone of the interior. Announcement of availability will be made by medical supply distribution depots. Extensive use of benzyl benzoate in the E.T.O. has demonstrated that it is superior to sulfur ointment for the treatment of scabies in that only two applications of the drug will cure over 90 percent of cases, it does not soil clothing or have a disagreeable odor, bathing facilities are not so essential to the carrying out of the therapy, disinfection of

clothing is not essential, and the only complication of treatment is moderate dermatitis of the genitalia in about 10 percent of patients, and this is relatively transitory.

Directions

1. *Preparation of medication.* The material will be supplied in a concentrated emulsion form, and it must be diluted with water before use. Mix thoroughly with an equal volume of water; then add two additional parts of water and shake well. This produces an approximate 25 percent emulsion.

2. Have the patient take a thorough hot bath with scrubbing of affected sites if facilities are available.

3. Apply the liquid benzyl benzoate preparation with a paintbrush or spray on with an insecticide gun. A large cotton swab, held by an instrument as in preparing the skin for surgical procedures, may also be used if paintbrushes and/or insecticide guns are not available. Cover *all parts of the body from the neck down.* The application should be made *carefully by an attendant.*

4. Twenty-four hours later repeat the application of benzyl benzoate emulsion, but it is not advisable for the patient to take a bath before the second application. A third application may be made on the following day if the itching is not relieved but usually this is not necessary. Benzyl benzoate therapy *should then be discontinued entirely for one week;* the chances are over 90 percent that the infestation is cured and further application may result in a dermatitis. A few patients may complain of some degree of pruritus for several days after the treatment is completed. Usually this is due to mild irritation from the therapy and not to the persistence of the scabetic infestation. If troublesome, this pruritus may be treated with mild antipruritic lotions such as calamine lotion.

Medical laboratory along **Ledo Road from India to Burma. All buildings** in this area are built of bamboo. Signal Corps photograph.

TREATMENT OF RELAPSES OF VIVAX MALARIA

During the period December 1943 to July 1944, a board appointed by The Surgeon General supervised studies in four general hospitals in which eight courses of therapy were employed for the treatment of relapses of *vivax* malaria (*The Bulletin,* February 1944, page 14).[1] The courses of treatment at the different hospitals were as follows:

1. *Bushnell General Hospital*

Group I. Totaquine 0.650 gm. t.i.d. for five days, and plasmochin[2] 0.01 gm. t.i.d. for three days.

Group II. Totaquine 0.650 gm. t.i.d. for five days, then totaquine 0.650 gm. daily for a total of sixty days.

2. *Harmon General Hospital*

Group I. Atabrine 0.2 gm. every six hours for five doses, then atabrine 0.1 gm. t.i.d. for six days. No treatment for twenty-four hours, then plasmochin 0.01 gm. t.i.d. for three days, then atabrine 0.1 gm. daily, six days each week, for a total of sixty days.

Group II. Atabrine 0.2 gm. every six hours for five doses, then atabrine 0.1 gm. t.i.d. for six days, then atabrine 0.1 gm. daily, six days each week, for a total of sixty days.

3. *Kennedy General Hospital*

Group I. Quinine 0.650 gm. t.i.d. for three days, then atabrine 0.1 gm. t.i.d. for five days. No treatment for twenty-four hours, then plasmochin 0.01 gm. t.i.d. for three days.

Group II. Totaquine 0.650 gm. t.i.d. for three days, then atabrine 0.1 gm. t.i.d. for six days. No treatment for twenty-four hours, then plasmochin 0.01 gm. t.i.d. for three days.

4. *Percy Jones General Hospital*

Group I. Atabrine 0.2 gm. every six hours for five doses, then atabrine 0.1 gm. t.i.d. for six days. No treatment for twenty-four hours, then plasmochin 0.01 gm. t.i.d. for three days.

Group II. Same as group I, but omitting the plasmochin.

The results of the different courses of treatment are presented in table I. All patients were observed for at least ninety days after the conclusion of treatment. It will be noted that the average number of previous relapses was about the same in all groups. There was no significant difference in the percentage of patients who relapsed subsequent to the different methods of treatment employed. All of the plans of treatment promptly controlled the symptoms of acute attacks, and there was no significant difference in this respect.

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1. The members of the board were Major General Shelley U. Marietta, U. S. A., chairman, Brig. General George R. Callender, U. S. A., Colonel Thomas T. MacKie, M. C., Lieut. Colonel Francis R. Dieuaide, M. C., and Lieut. Colonel O. R. McCoy, M. C.

2. Doses of plasmochin are in terms of the hydrochloride.

TABLE I

Malaria treatment summary

(Including only the results of treatment of the first attack which occurred during the study)

Hospital		Treatment groups	No. of patients treated	Av. No. of attacks previous to study	No. of patients who relapsed	Percent of patients who relapsed	Interval before relapse in days*		
							max.	min.	av.
Percy Jones	I	Atabrine 2.8 gm. in 7 days	42	8	21	50	131	38	78
	II	Atabrine 2.8 gm. in 7 days Interval 1 day Plasmochin 0.09 gm. in 3 days	36	8	18	50	147	38	89
Harmon	I	Atabrine 2.8 gm. in 7 days Interval 1 day Plasmochin 0.09 gm. in 3 days Atabrine 0.6 gm./wk. 49 days	86	7.5	52	60	207	20	64
	II	Atabrine 2.8 gm. in 7 days Atabrine 0.6 gm./wk. 53 days	81	7.7	49	61	198	†	50§
Kennedy	I	Quinine 5.85 gm. in 3 days Atabrine 1.5 gm. in 5 days Interval 1 day Plasmochin 0.09 gm. in 3 days	67	9.0	38	57	150	21	59
	II	Totaquine 5.85 gm. in 3 days Atabrine 1.5 gm. in 5 days Interval 1 day Plasmochin 0.09 gm. in 3 days	62	8.5	31	50	127	13	70
Bushnell	I	Totaquine 9.75 gm. in 5 days Plasmochin 0.09 gm. in 3 days	48	8	29	60	77	4	26
	II	Totaquine 9.75 gm. in 5 days Totaquine 0.65 gm. daily for 55 days	53	7	32	60	95	‡	34§

*Interval between completion of all treatment and onset of the next attack.
†Four patients broke through suppression.
‡Thirteen patients broke through suppression.
§Average does not include patients who broke through suppression.

DENTAL WORK ON A BEACHHEAD

A prosthetic team attached to an evacuation hospital accompanied troops in the establishment of the Anzio beachhead and did their work in a tent. Enemy shellfire became so heavy that they had to "dig in." The tent floor was lowered 3 feet, and a sand parapet constructed around the edge to a height of 2½ feet. The work done on the beachhead by this team from 22 February to 30 April 1944 comprised 37 full dentures, 112 partial dentures, 20 dentures repaired, 2 inlays, and 3 bridges repaired.

CROSS CONNECTIONS AND BACK-SIPHONAGE IN WARTIME

The rapid expansion of industry and transportation for military purposes in the war period has aggravated the general problem of cross connections and back-siphonage and has resulted in a number of outbreaks of water-borne disease. Early in 1943, the Committee on Sanitary Engineering of the Division of Medical Sciences of the National Research Council decided to review this problem. A temporary subcommittee was appointed to scrutinize the rules and regulations promulgated by military, semimilitary, and civilian agencies, to recommend modifications in policies and practice, and to summarize its conclusions and recommendations.

The subcommittee[1] worked about a year. Many of its recommendations were the subject of negotiation with military and other agencies and have resulted in adjustments in policies, regulations, and practices. The Committee, with the approval of the National Research Council and the surgeons general, decided to make public the findings of the subcommittee in order that the findings may be more widely useful. An abstract of the conclusions and recommendations of the subcommittee follows:

1. The ultimate ideal is to make auxiliary water supplies unnecessary.

2. The personnel operating water supply connections should be instructed in protection of the water supply.

3. Vacuum breakers should be used at fixtures permitting back-siphonage.

4-5. Air gap separation should be used at process water connections and between potable water lines and sewers or drains.

6-7. Pipes in dual systems should be marked by painting, outlets of nonpotable lines should be made unavailable for drinking, and fire boats should not pump into potable water lines. Pierhead water services should be surveyed for adequacy. Back-flow preventers of double-check valves should be installed on pipes carrying drinking water at pierhead property lines; also, back-flow preventive devices should be installed at each shipside outlet.

10. Cross connections between potable and nonpotable water supply lines on vessels should be broken and maintained in accordance with current Coast Guard and Army regulations.

11. Improved back-flow preventers are superior to double-check valves.

12-14. Only approved, tested back-flow preventive devices should be used and these should be properly installed to avoid introduction of contamination by the devices themselves.

15. Federal agencies should promote adoption of state and local codes controlling water piping and plumbing.

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1. The members were E. Sherman Chase, Joel I. Connolly, Francis M. Dawson, Raymond F. Goudey, Sol Pincus, and Warren J. Scott (chairman).

16. Local health agencies should investigate and correct dangers from back flow.

17. The appropriate Federal agencies should establish a unified national program to control back-flow conditions.

[In the Sanitary Corps there are many highly trained and specialized sanitary engineers (MOS 7960) who are available for making surveys and recommendations for the protection of Army water supplies. Requests for engineering services should be addressed to service command or theater headquarters for assistance in discovering these sanitary defects and in preventing disease due to them.—Ed.]

TRAINING AIDS ON SANITATION

A number of different kinds of instructive posters on sanitation, 14 by 20 inches, in color, are now available for display in barracks, company rooms, latrines, or other places where troops will see them. A few of them are illustrated here. The distribution of these posters recommended is two copies per company or similar unit and information copies to all interested headquarters. Automatic distribution will not be made, except to units of the Army Air Forces. Distribution will be accomplished as outlined in Part One, Section 1, paragraphs 3, 4, and 5, A.S.F. Circular No. 181, 16 June 1944.

THE PROBLEM OF REPAIR OF DENTAL ENGINE HANDPIECES

Dental engine handpieces are the smallest items, by size, of all technical Medical Department equipment; yet they constitute one of the largest maintenance problems in the Medical Department. Despite procurement already in excess of 100,000, these small handpieces still remain in "critical" supply and in a back-order status. This apparently unhealthy supply picture is actually a compliment to the Dental Corps whose program has taxed to the utmost the ability of the entire dental industry adequately to supply this item required for the treatment of practically every dental patient. The pace of this program and the amount of service required is such that the actual life of this instrument, in some instances, becomes as short as six weeks, as compared to a civilian life expectancy of one year or longer.

Of the many handpieces purchased, the repair of certain types is not economical. Medical Department Items 5261005 Engine, handpiece, angle, Doriot (round nose), 5263005 Engine, handpiece, straight, Doriot (round nose), and the old type of 5261005 Engine, handpiece, angle, Doriot (hexagonal sleeve), manufactured by Chayes Dental Instrument Company, should be disposed of through salvage under the provisions of paragraph 7*c*(4), War Department Circular No. 7, dated 5 January 1944. The new type of 5261005 Engine, handpiece, angle, Doriot (hexagonal sleeve), manufactured by Chayes Company, can be differentiated from the old type by the letter "W" on the end of the sleeve.

On becoming unserviceable, handpieces require either salvage under existing regulations or repair by an installation with facilities comparable with a handpiece factory. Unfortunately, commercial facilities are overburdened with new production and somewhat loath to respond to requests for special purchase of repair service or materials, except at high prices and long shipping schedules for parts. Factory dealers also find it impossible to procure repair parts in anything but token quantities. As a result, short supply becomes more acute as unserviceable handpieces accumulate at supply points for return to 5th echelon repair shops.

At present the Medical Department operates two 5th echelon repair shops capable of expertly repairing such instruments. The 5th echelon shop at the St. Louis Medical Depot probably has the greater experience in this respect. During its first six months, attempts were made to have repairs made by the manufacturer. This was unsuccessful and the ever-increasing backlog of handpiece angles received for repair and return to stations or disposal as unserviceable made imperative the development of a section to accomplish such repairs on a factory rebuilding basis. This was established. Initial produc-

tion was irregular and small for months because of the necessity of training personnel, procuring parts, and developing job methods. In that early period, some angle handpieces were rebuilt which were below standards for return to service because of inadequate methods and incomplete tests after repair. As a result of these early trials only about 3,500 of such instruments were rebuilt during 1944.

During 1945 this quantity has steadily increased, and in February 1,250 angle handpieces were rebuilt and returned to supply channels. This not only represents an encouraging reduction of backlog, but a rate of monthly production which will be adequate to accomodate current monthly receipts of about 700 unserviceable angles. Production line methods now employed enable a single mechanic to repair and recondition completely as many as three angles per hour. Such production rate reduces cost to less than two dollars per instrument, including materials.

It is believed that original job methods have been developed at the St. Louis Medical Depot shop which equal, and in some instances improve, the rebuilding procedure of handpiece manufacturers. These methods involve the centrifugal solvent cleaning of all parts, the development of an electrical soldering method which prevents discoloration of plated surfaces, heat control methods to avoid loss of hardness of steel parts, and testing apparatus which simulates actual operating conditions.

The Medical Department has also prepared War Department Technical Manual 8-638, "Engine, Handpiece, Straight; Engine Handpiece, Angle," published 23 September 1944, which treats of the repair and reconditioning of such instruments. The experience of the 5th echelon Medical Department repair shop at St. Louis prompts careful study and attention to the detailed instructions contained in this manual. A careful perusal of this manual by all dental personnel will result in more careful preventive maintenance, care in handling, and longer life to these critically needed instruments.

SPECIFICATIONS FOR FRESH MILK

Throughout this war, troops within continental United States have received a daily average of more than one-half pint of milk per man. By the use of frozen, homogenized milk, patients on hospital ships are now receiving fresh milk. This has been accomplished without the occurrence of any milk-borne diseases.

Fresh milk has been purchased under specifications outlined in Circular Letter No. 377, Office of The Quartermaster General, which has been transposed into specifications about ready for distribution. No major changes have been made in

regard to types of milk which may be purchased or in the requirements for the different types. The requirements are, however, more explicit in the specifications than they were in the circular letter. This applies particularly to the bacterial quality of the milk prior to pasteurization.

When sampling milk for bacterial analysis prior to pasteurization, the samples should be aseptically taken from the storage tanks or from the pasteurizing vats before the milk is heated. If the bacterial analysis shows that the milk does not meet specification requirements for the type of milk purchased, the plant processing the milk and the health department concerned should be notified, and, if corrective action is immediately instituted, a reasonable time should be allowed for correcting conditions. If the quality of the milk is not improved to the extent that it meets specification requirements, the plant should be disapproved and a new source of supply obtained.

Surveys of milk supplies in the service commands have shown that the attention given to the quality of milk prior to pasteurization is not always adequate. Instances have been noted where, if the quality of the milk as delivered met specification requirements, it was considered to be satisfactory. The quality of the milk accepted at Army installations should meet specification requirements not only as received but prior to pasteurization.

A German horse, while being captured, fell into a German trench in Serrig, Germany. "GIs" are rescuing the animal.

DENTAL IMPROVISATION

The mechanical aptitude of the American soldier has produced marvels of improvisation all over the world along with many other improvisations previously published in *The Bulletin*. Consider for the moment the exploits of the dental clinic in the medical dispensary serving the 20th Bomber Command.

First, a padded wooden dental chair was constructed, the back of which was adjustable forward and backward. This was soon replaced by a later model—an airplane pilot's seat mounted on a concrete block, with a footrest added. A nonstandard aviation dental field chest yielded an adjustable headrest for the chair and an electric motor for the foot-powered drill. The motor was designed for 110-volt current, while the current available was 220 volts; this obstacle was overcome by wiring a 150-watt, 110-volt electric bulb in series with the motor. A source of chlorinated water for the chair was devised by filling two large, low-pressure oxygen tanks two-thirds full of water, with air forced in through valves to provide the necessary pressure. From salvaged airplane parts, an aluminum bowl and aluminum oxygen tubing have been transformed into a cuspidor with a revolving stream of water. Suction for the saliva ejector has been improvised from a portable vacuum cleaner, with a large bottle for the water trap. Finally, a pair of low-pressure oxygen tanks and a "blowgun" nozzle, found in the airplane salvage yard, furnished those blasts of air that dentists frequently direct into the patient's mouth.

The dental officer and his technicians had as their goal a clinic "which would approximate as nearly as practicable a dental office in the United States." Ingenuity and resourcefulness enabled them to reach that goal.

NEW MOVIE—DENTAL HEALTH

The Army has just completed and approved a new movie film entitled "Dental Health." The basic manuscript was prepared by the Dental Division, Surgeon General's Office, with the cooperation of Dr. Lon W. Morrey, Bureau of Public Relations, American Dental Association. The professional scenario writers of the Signal Corps Photographic Center then developed the scenario. The movie was produced in Hollywood by the Army Signal Corps (Photographic Center, Western Division) and through the facilities of the Disney and Pine Thomas Studios.

The running time of the film is about twenty-four minutes. The film is a combination of animation and live action shots which depict to the soldier the need for oral hygiene, the proper care of the teeth and gum structures, the function of the teeth, some methods which are known to reduce the incidence of caries, the progress of caries, the function and use of

artificial dentures, and how dentures should be cared for. The last scene is taken from movies made by the Signal Corps of actual combat on an island in the Pacific. The commentary is that during the days and hours of combat the soldier will have little, if any, time to devote to oral hygiene; for this reason his teeth and oral structures must be in the best possible state of dental health prior to the event of battle.

The principal professional actor is Private Kent Smith, who is on duty with the Army Air Forces in the vicinity of Los Angeles. Private Smith in civil life was and still is under contract with R.K.O. Studios. He took the part of a dental officer. In addition, there were several "bit" actors, a number of Army personnel selected for special parts, and a company of soldiers.

FUNCTIONALLY-PACKED HOSPITALS

In the early days of this war, the hospitalization requirements of present-day mobile war were unknown. The hospital assembly job was to prepare and ship with appropriate packing lists the items called for on the basic equipment list for the particular hospital. This system did not long continue without recommendations, suggestions, and criticism from the field, and these gradually led to the elimination of nonessential items.

Another progressive step was the alignment of packing lists in the same sequence as the document on which the assembly was shipped. Next came improvements in packaging and marking, designed to get material to the proper place in proper condition. Later came the War Department Shipping Document, which replaced the old shipping ticket and packing list combination. Every effort was made to lighten the burden of the man in the field.

In June 1943 most of the difficulties from the standpoint of the receipt of medical supplies in the field had been overcome. Units continued to complain, however, that too much time was required in the field to assemble the hospital into its proper functional groups—i.e., receiving, wards, operating theaters, etc. Moreover, when properly assembled by the unit, no facilities existed for the transportation as a functional group, since the only boxes available were those shipped originally by the depot. This left but two choices when it became necessary for a mobile or semimobile hospital to move: to scrap the functional groups and replace the items in the original containers, or to attempt haphazard time-consuming repackaging of components as a functional group. A more serious complaint was that when only a portion of the hospital was to be activated (as quite often is the case) the greatest difficulty was in locating the specific supplies required.

In July of 1943, in accordance with plans developed by

The Surgeon General's Office, the Medical Section of the Atlanta Army Service Forces Depot was assigned the responsibility of constructing an experimental model of a functionally-packed 400-bed evacuation hospital. The finished hospital assembly contained 800 packages, each marked for a specific use or section within the hospital, and the total weight was about 78,000 pounds. All boxes were packed for amphibious landings and were fastened by hinges and hasps, thus permitting easy access and re-use. The experimental hospital met with great favor with the field and so popular was its immediate demand that seventeen more were built by the Atlanta Medical Section that year, plus twenty-seven other functional-type hospitals, totaling more than 15,000 beds in all.

Since the initial experiment, hundreds of functionally-packed hospitals have been turned out by the Atlanta Medical Section, and they are now in operation throughout the world. Reports have indicated that the complaints discussed above have been entirely eliminated, and, as testimony to their newly achieved mobility, one hospital commander reported that, during the African Campaign alone, his 400-bed field hospital, functionally packed, moved eighteen times. The demand for functional hospitals is ever increasing, and more semimobile and formerly "fixed" hospitals are being converted.

Some advantages of the functionally-packed hospital are: (1) when received, the assembly is ready for use in the field, (2) the crates and boxes are almost all re-usable, (3) many large pieces of equipment (refrigerators, sterilizers) can be operated from within the crate, (4) amphibious, waterproof, rubber-gasketed chests are used for the packing of the items subject to damage by water, (5) selection of equipment for setting up an advance section or partial operation has been made simple, (6) the receipt and tallying-in of the assembly is greatly simplified, and (7) many of the boxes are constructed so they can be converted to a practical use in the field—i.e., ward dressing tables, desks, etc.—then reconverted into a container when necessary.

The following details constitute the present-day functionally-packed hospital: (1) Items are segregated as to their class of cargo—i.e., wet cargo, general cargo, corrosive cargo, compressed gases cargo, inflammables cargo—and a separate shipping document is written for each class of cargo. (2) Items are further segregated as to their uses, and a separate shipping document is written for each functional section of the hospital. (3) Items are still further segregated for each identical independent unit within a functional section of the hospital. (4) Items are packed, labeled, and marked according to the class of cargo and functional hospital section as shown on the shipping document. (5) Items are packed within wooden boxes fastened by hinges and hasps. The boxes are waterproofed and strapped in accordance with current prac-

tices as prescribed for overseas shipment in General Army Specifications 100-14A and/or Ordnance Department Specification AXS 1246.

Among the most recent developments has been the complete functionalization of the portable surgical hospital, 25-bed (CZ). The Medical Section, Atlanta Army Service Forces Depot, carrying out further experimentation with this hospital, has made it possible for the entire portable portion of the unit to be packed within thirty-three amphibious chests, each chest containing a packboard on which are already mounted the supplies required for a particular purpose within the organization. This will enable the unit to be landed ashore, or floated in, if necessary, and on opening their assigned chest each of the thirty-three enlisted personnel comprising the outfit will have a fully packed packboard, weighing less than 60 pounds each, ready to be transported to the scene of the operation. The reserve supplies, of course, are merely packed in the usual functional manner, without packboards.

The Atlanta Medical Section has also functionalized the equipment for auxiliary surgical groups, making possible the placement of all equipment for each team (other than dental teams) within one container.

The Germans blew up their pillboxes near Brest but left two of their "medics" with wounded Germans in a pillbox. Here an American soldier is bringing a German "medic" out of one of them. Signal Corps photograph.

CONSERVATION OF FIELD SUPPLIES AND EQUIPMENT

It has been brought to the attention of The Surgeon General's Office that field supplies and equipment are being consumed by organizations not actively engaged in field duties. The use of such supplies and equipment for routine care of the sick in garrison is prohibited by Army Regulations. Instances are constantly occurring where organizations on receipt of movement orders find themselves short of medical supplies because they have been used in the routine care of the sick while in garrison. Station hospitals have adequate quantities of ordinary medical supplies for the care of the sick, and all concerned will take steps to see that such supplies rather than field supplies are used in regimental dispensaries and other similar installations engaged in the routine care of the sick. Medical Department field supplies and equipment will be reserved for the use for which they are intended—namely, to take into the field. The above does not apply to those Class 9 Medical Department items which are now a part of cantonment-type hospital equipment.

EXTRA SUPPLIES FOR D-DAY

Medical supply officers of the First Army, while planning the amphibious assault on Normandy, were troubled by the small space allocated to medical supplies and equipment; but, through ingenuity and resourcefulness, this obstacle was overcome. Arrangements were made with the Navy to place aboard each LST a unit of supply consisting of 100 litters, 320 blankets, 4 splint sets, 3 boxes of surgical dressings, and 96 units of normal human plasma. It was thus possible to bring ashore, during the fourteen days following D-day, 30,000 litters, 96,000 blankets, and large quantities of other items, in addition to the allocated tonnage.

For the assault troops, moreover, there was designed a special waterproofed unit of supply, which was carried ashore by the aid men and which served as additional life preservers. This unit consisted of seven specially treated mortar shell cases, and contained a total of 100 first-aid dressings, 50 packages of sterilized gauze, 50 three-inch bandages, 10 packages of sulfanilamide, 25 boxes of morphine Syrettes, 7 packages of normal human plasma, 1,000 sulfadiazine tablets, 100 halazone tablets, and 1 sterile gauze packet impregnated with boric acid or petrolatum. The foregoing supplies were issued to troop units, scheduled to arrive on the far shore during the first four days, on the following basis: one unit of supply per infantry, artillery, chemical, engineer, and ranger battalions; two units per collecting company, divisional; four units per clearing company, divisional; and six units per medical battalion (engineer special brigade). These units proved to be extremely valuable in the early hours of the assault, when the unloading of scheduled medical supplies was delayed.

WHITENESS-RETENTION IN LAUNDERED FABRIC

The predominant color of Medical Department linen is white. The standard for comparison of whiteness-retention in hospital linen is that of new linen. Whiteness-retention indicates the percentage of whiteness retained or increased in laundered fabric, as compared with the original color. Whiteness-retention tests should be made frequently by laundry supervisory personnel. A practical whiteness-retention test should be accomplished only in clear daylight, as artificial light includes colors which reflect from the fabric and produce a distorted sense of comparison. A new white cotton or linen article, folded uniformly with the articles to be tested, is placed in the center of a stack of twenty like articles. These articles, selected at random in the finishing department of a laundry, will give a visual comparison between the shades of white of the laundered fabric and the new article.

Whiteness-retention may be above 100 percent, indicating a white reflectance greater than that of the original article; this demonstrates improvement through washing. Loss of whiteness in laundering may be due to one or more of the following: inefficient washroom supplies, improper wash formulae, improper wash formulae execution (poor sudsing, insufficient rinsing, or improper temperature control), overloading of washer, improper classification (grouping of wash lots), lime soap deposits (chemical breakdown of suds due to hard water), insufficient bleaching, overbleaching, inadequate souring (residual alkali-yellow), and overbluing.

This simple test will enable hospital laundry personnel to effectively maintain a uniform degree of whiteness. Complex precision equipment used in laboratories is not necessary.

Eighth Evacuation Hospital personnel tents "winterized" by adding wooden floors, side walls inside canvas walls, tight-fitting doors, and oil-burning stoves. Signal Corps photograph.

NEWLY STANDARDIZED ITEMS

Hospitals in the zone of the interior frequently requisition newly standardized items long before they are available for zone-of-interior distribution. This causes needless paper work in depots and in hospitals, and does not hasten in any way the hospitals' receipt of the item.

Many steps are taken and not a little time is consumed in the standardization of an item. It should not be assumed that distribution can be made immediately after procurement has been authorized. Production-time lag, which varies from two to six months, delays the distribution of a newly standardized item. Even after items are rolling off assembly lines, Medical Department installations in the zone of the interior cannot expect receipt immediately. The initial requirements of theaters of operation and separate bases must be satisfied first. Tactical organizations next receive the quantities of the item allowed by the basis of issue. Only after the above distribution has been made can zone-of-interior stations be supplied.

Medical supply officers in zone-of-interior hospitals are informed routinely when a newly standardized item is placed in procurement. At the same time, they are instructed to submit no requisitions until notified by their depot that the item is available for distribution. This advance information is given for the specific purpose of advising stations that a nonstandard item is being standardized and will be available presently for distribution. Accordingly, no large purchases of the nonstandard item should be made as an emergency measure. Action should be taken immediately by medical supply officers to inform the professional services in their hospitals of the new item and the authorized basis of issue. Then, the requirements of the hospital may be set up in a suspense file in the medical supply office, and, when information is received that the item has been released for zone-of-interior distribution, a requisition may be submitted for amounts up to the authorized allowance for the particular hospital involved.

If, before a newly standardized item is distributed to zone-of-interior installations, it is needed for actual treatment of a patient, an emergency purchase may be made under the provisions of AR 40-1705. It must be borne in mind that no shelf stock is authorized and that only such quantities as are needed properly to treat the patient should be procured.

Any action other than that described results only in the waste of time, temper, and paper, for distribution depots automatically cancel all requisitions received before the item is available for zone-of-interior issue.

Dental Personnel in Italy and North Africa.—The ratio of dental officers to the number of troops in the theater in 1944 varied from 1:833 to 1:939. The average rate has been about one dental officer per 850 men.

THE MEDICAL NUTRITION LABORATORY

Progress toward activating this installation in Chicago has been rapid since November 1944 when personnel first reported for duty at the Medical Nutrition Laboratory, the construction of which was completed according to schedule early in March 1945. Notwithstanding restrictions on priorities, and the scarcity of laboratory equipment and some chemicals, this installation is almost ready to function in all categories of research authorized for investigation. Projects which could be investigated with limited facilities are already under way. Thus, the adaptation of packaged combat rations for use in light, soft, liquid, and special hospital diets was initiated as a project by using the kitchen facilities of the adjacent Quartermaster Subsistence Research and Development Laboratory. Similarly, the appraisal of the nutritional status of troops in various theaters of operation has been furthered by the construction of portable kits containing laboratory equipment and chemicals. These kits have been developed in collaboration with the Harvard Fatigue Laboratory and the William H. Park Laboratory, and personnel have been trained in their use. In addition, the laboratory has completed the thirty-first session of the course in food and nutrition. This two-month course is authorized for newly commissioned nutrition officers. The class also carried out a nutritional survey at Carlisle Barracks, Pennsylvania, as final training before being assigned to the field as nutrition officers.

The immediate events scheduled for the laboratory include a conference of civilian consultants in nutrition, preparatory to the initiation of remaining research projects. Experimental animals are now being procured, and the various laboratories devoted to investigation of physiology, biochemistry, and microbiology will soon be in full operation. The official dedication of the laboratory is scheduled for early June.

NEW FILM—"THE DIARY OF A SERGEANT"

This film (Misc. 1129) is a photographic diary of Sergeant Russell, who lost both hands on D-day. It portrays his early mental depression and how he became inspired by seeing "Meet McGonegal" (Misc. Film 956) to be proficient in the use of his prostheses. The film shows his progress in physical and mental reconditioning. Sergeant Russell was able to carry on most of his normal activities within four months after losing his hands. The film has great value for those who have lost limbs. Distribution is being made on the basis of one copy for each service command film library, one for each amputation hospital, and a special distribution.

TEST FOR DIAGNOSIS OF NEUROCIRCULATORY ASTHENIA

A hyperventilation test has been devised and used in a comparative study of normal young adults, neurocirculatory asthenia patients, and patients with intrinsic pulmonary or cardiac disease with and without concomitant neurocirculatory asthenia. The test, according to the author, Major Meyer Friedman, M.C., consists of having the patient hold his breath, after a preliminary deep inspiration, as long as possible. The number of seconds he refrains from inspiration is recorded. At the end of this initial breath-holding period, he is allowed to breathe normally for three minutes. The pulse rate is then determined, and he is instructed to breathe deeply and rapidly for 45 seconds, during which period he takes 45 respirations. Immediately at the end of this hyperventilation period the pulse rate is determined and the patient is instructed to hold his breath once more as long as he is able to do so. The number of seconds he refrains from breathing is again recorded. A ratio, designated as the hyperventilation index, is then obtained by dividing the breath-holding time after hyperventilation (expressed in seconds) by the breath-holding time observed before hyperventilation. Thus, if a subject held his breath 60 seconds before hyperventilation and 90 seconds after hyperventilation, his hyperventilation index (H.I.) is calculated as 90/60 or 1.50. It should be stressed that the patient must be thoroughly instructed to refrain from breathing during each breath-holding phase until it becomes utterly unendurable, and nasal breathing during the hyperventilation phase of the test must be insisted on.

Because the test depends on a subjective function, considerable variation must be expected, not only in a group of individuals, but, to a less degree, in the same individual at different times. However, a value for the H.I. ratio below 1.30 was considered abnormal. When a low or fractional H.I. is found in an individual, he will be found to be easily dyspneic on slight exertion. The severity of his NCA syndrome will be found also to be marked.

When the normal individual and the patient suffering from an intrinsic pulmonary or cardiac disorder (but without neurocirculatory asthenia) were given the hyperventilation test, the range of the H.I. obtained in both types of individuals was about the same. When the severely dyspneic NCA patient, however, or the patient suffering from both intrinsic cardiorespiratory disease and the NCA syndrome were studied, the H.I. obtained was invariably abnormally low and usually less than unity. While the author knows of no other test of such benefit in the routine diagnosis and assessment of the NCA syndrome, it must be stated that the test is not positive in all NCA patients.

Abstract of paper submitted through The Surgeon General's Office to the Journal of Clinical Investigation.

The test and the index obtained from it were presented, not only as a positive diagnostic for the detection of severe neurocirculatory asthenia, but also as a method for the assessment and differentiation of the part played by the NCA syndrome in the production of cardiorespiratory symptoms in a patient who suffers from both it and organic cardiorespiratory disease.

CIVILIAN CONSULTANTS IN NEUROPSYCHIATRY

Dr. Alan Gregg, director for medical sciences of the Rockefeller Foundation, has recently been appointed a civilian consultant in neuropsychiatry to The Surgeon General. Dr. Gregg has made many significant contributions to medicine, with a special interest in the field of psychiatry. A complete list to date of the civilian consultants in neuropsychiatry follows:

Dr. Edward A. Strecker, professor of psychiatry, University of Pennsylvania School of Medicine, Philadelphia (psychiatry).

Dr. Arthur H. Ruggles, superintendent, Butler Hospital, Providence (psychiatry).

Dr. Frederick W. Parsons, former commissioner, New York State Department of Mental Hygiene, New York (psychiatry).

Dr. Edwin G. Zabriskie, professor of clinical neurology, Columbia University College of Physicians and Surgeons, New York (neurology).

Dr. Frederic Gibbs, University of Illinois, College of Medicine, Department of Psychiatry, Chicago (electroencephalography).

Dr. Alan Gregg, director for medical sciences, Rockefeller Foundation, New York (psychiatry).

Mrs. Elizabeth H. Ross, secretary, American Association of Psychiatric Social Workers, Philadelphia (psychiatric social work).

CONFERENCE OF NEUROPSYCHIATRISTS

The chief neuropsychiatrists of general hospitals, convalescent hospitals, disciplinary barracks, and processing centers of the First, Second, and Third Service Commands and representatives of the Neuropsychiatry Consultants Division, Surgeon General's Office, held a conference at Mason General Hospital, Brentwood, Long Island, on 12 April 1945 and at the Convalescent Hospital, Camp Upton, Long Island, on 13 April 1945. Among the subjects discussed were the following: Military Neuropsychiatry; Therapeutic Program of the Neuropsychiatric Hospital; Therapeutic Contribution of the Reconditioning Program; Group Therapy; Teaching of Military Neuropsychiatry; Problems of Administration of the Closed Neuropsychiatric Ward; Neuropsychiatric Problems of the Judge Advocate General's Office; Psychiatric Problems of the USDB; Psychiatric Problems of the Disciplinary Installation Dealing with AWOLs; Constitutional Psychopathic States; Mental Deficiency as Related to Military Problems; The Convalescent Hospital; Aims and Objectives of the Reconditioning Pro-

gram; Use of Psychologists and Social Workers in a Neuropsychiatric Reconditioning Program; Who shall be Treated in General Hospitals and How Long; Common Psychiatric Problems in Convalescent Patients; Use of Sodium Amytal and Adjuvant Tests in Hospital Therapy; Problems of Debarkation of Neuropsychiatric Patients; Medical Problems of the Neuropsychiatric Service; Surgical Problems of the Neuropsychiatric Service; Special Psychiatric Problems of the Neuropsychiatric Service; Neurological Problems of the Neuropsychiatric Hospital; and Psychiatric Problems Seen on the Surgical Service.

CONFERENCE OF CONSULTATION SERVICE PERSONNEL CONSULTANTS

At a conference of Consultation Service personnel consultants, Chicago, 12 to 14 March, the formulation of the contribution of the clinical psychologist to the accomplishment of the Consultation Service was achieved, and the need for teamwork between psychologist, psychiatrist, and psychiatric social workers was emphasized. The duties of the psychologist in this team include the screening and routing of referrals to the Consultation Service, studying the training, motivation, and morale of the command, participating in group therapy, devising and operating an inclusive testing program, advising on problems of classification and assignment, conducting remedial training of selected cases, and participating in the training of new personnel. It was recommended that the psychologist be considered a consultant with the functions of examining individual problems with professional objectivity and that Consultation Service officers be used as expert witnesses rather than as voting members of boards.

The conference was addressed by Major General J. A. Ulio, The Adjutant General, Brig. General A. G. Trudeau, acting director of Military Training, Army Service Forces, and Colonel W. C. Menninger, director, Neuropsychiatry Consultants Division, Surgeon General's Office. General Ulio emphasized the extremely practical approach of the Army psychologist and called attention to the excellent cooperation between The Adjutant General and the Medical Department in their use of psychologists. General Trudeau spoke of the role of the psychologist in training, indicating their part in the education of line officers, in preventive mental hygiene, and in the large number of ways of improving morale. Colonel Menninger emphasized the important mission in preventive medicine charged to the Consultation Service team.

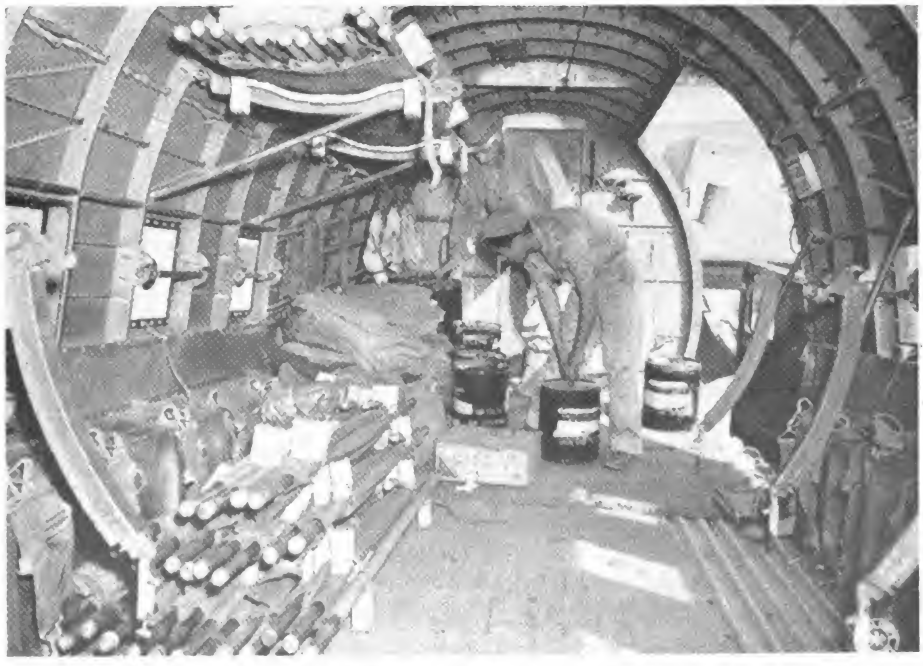
Monthly Medical Meeting.—At the monthly meeting of medical officers at the Army Medical Center, Washington, D. C., 19 April, Major George P. Robb discussed "Differential Diagnosis of Mediastinal Disease by Angiocardiography"; Colonel John T. King, "Pulmonary Embolism from Obscure Sources"; Lieut. Colonel Wilbert H. McGaw, "Nonrigid Bone Grafts"; and Captain David J. Dugan, "Decortication of the Lung."

THE TOLEDO MEDICAL DEPOT

The Toledo Medical Depot has recently been transferred, on an operating basis, to the Treasury Department for the better fulfillment of international aid requirements. As a Medical Department installation it has ceased to exist, along with the Chicago Medical Depot and the San Antonio Medical Section, which were inactivated in 1944.

The Toledo Medical Depot began operation in April 1941 and soon found itself vexed by problems: insufficient storage space, lack of supply-trained officers, and a chronic scarcity of civilian personnel. The last was the most serious problem.

In spite of these problems, the Toledo depot has served with distinction during the past four years. It has packed and shipped 748 unit assemblies, which vary in size from a 10-bed dispensary to a 3,000-bed convalescent hospital. One hundred and sixty-three of these units were 1,000-bed general hospitals. During its last year of service, increasing emphasis was placed on packing and crating for export, including waterproofing and the prevention of corrosion. In common with all Medical Department depots, it bent its energies to the task of developing new methods of protecting medical supplies from the hazards of climate, transportation, and storage.



This U. S. Army ambulance plane loaded with mail and medical supplies returns to battle front after bringing casualties to a hospital in India.

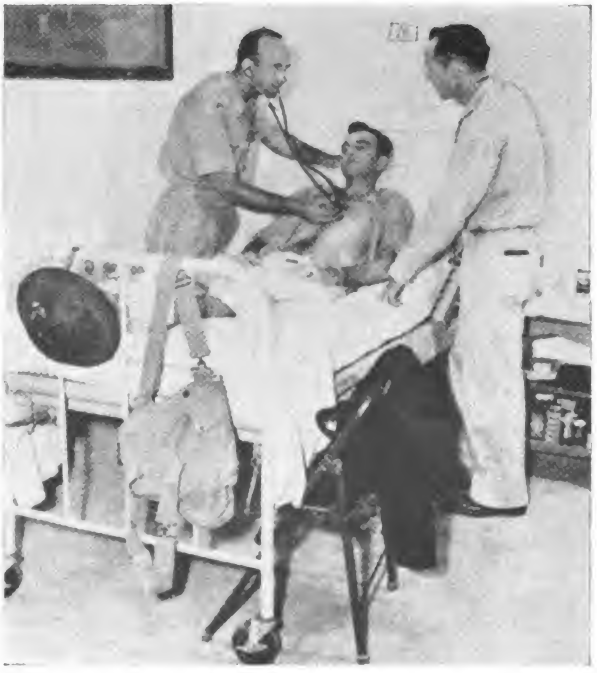
HISTORY OF PROFESSIONAL EXPERIENCE IN WORLD WAR II

Authors preparing professional articles for the clinical volumes of the medical history of World War II should be guided by one cardinal precept: the history is to be based on observations and experiences peculiar to this war. Unless the subject material is kept within its proper medico-military setting, there is likely to be a tendency for authors to dwell at too great length on the type of information ordinarily found in standard medical textbooks. This method of approach is to be avoided, for it would lead to the development of *descriptive* articles rather than *historical* narratives. It is recognized, however, that in some sections of the history, the descriptive technique must be used, as many new facts have come to our attention about injuries, diseases, and conditions resulting from experience during the years of combat. This applies particularly to missile wounds, trench foot, infectious hepatitis, scrub typhus, malaria, and other tropical diseases that do not ordinarily come under the observation of the average practitioner. But for the most part, the Army medical history will be concerned with the evolution of ideas that have led to the adoption of certain diagnostic, therapeutic, and preventive measures and the abandonment of others. It is obvious that in recording, interpreting, and evaluating discoveries and progress in war medicine and surgery the approach of the author must be historical in outlook and method. Only in this way will a revealing history emerge as to the part that medicine has played in the war.

British authorities have pointed out that the clinical volumes of the official British history of the last war took the form of a series of textbook articles. It is now recognized by them that this was not the proper way in which to present the story of war medicine. Hence, an official communication on this subject was issued some time ago in order to caution contributors against writing textbook descriptions for the British medical history of World War II. The following quotation from the British historians is pertinent: "We need not concern ourselves with the writing of textbooks; other people will do that. Our business is with history. Every disease, operative procedure, method of treatment, and investigation has, potentially, a story: the history of the part it played in the war, the way in which it affected the war effort, the effect on it of circumstances due to war, of the progress made in relation to it as a result of the war, the story of the problems and difficulties presented and of the evolution in time of the efforts to solve them." It can readily be seen that if manuscripts are developed in keeping with the British pattern or along similar lines, the textbook approach will be automatically eliminated.

Specific examples from our own medical experience that will lend themselves to this scheme of presentation include the

changes that have come about in the prophylactic administration of the sulfonamides, the shift in concept regarding the use of blood plasma as a complete blood substitute, the evolution of new methods of treatment for burns. Enthusiastic reports based on the experience of some observers at Pearl Harbor gave great impetus to the local and systemic use of sulfonamides in controlling infection in war wounds. Later experience, however, did not verify the soundness of these observations. It is now known that early and effective surgery is still the prime factor in wound management and that chemotherapy is only a valuable adjunct. Similarly, it was hoped that blood plasma might largely replace whole blood in the resuscitation of the seriously wounded. With increasing experience in various theaters of war, it became more and more evident that plasma, despite its great value in forward areas, did not fulfill the requirements of a complete blood substitute. Thus, emphasis shifted to whole blood as the agent of choice in preparing the seriously wounded for surgical procedures. As to the management of burns, at the beginning of the war the most popular treatment was the use of tannic acid. This method of therapy, however, was abandoned and the pressure dressing applied over fine-mesh petrolatum gauze was adopted as a standard Army technique.



An officer patient being given the final check-up before releasing him from U. S. Army hospital in India. August 1942. Signal Corps photograph.

In each of these instances and many others, one finds grist for the historian's mill. He must trace the underlying reasons for the early and enthusiastic acceptance of these and other developments. He must show why these procedures were discarded for more proficient practices. He must gather from every reliable source recorded experience bearing on these problems and weigh and evaluate it in the sobering light of accumulated knowledge. In short, he must tell a story in chronological order so that one may gain a panoramic view of the progress made in a particular phase of therapy. And in telling the story, the his-

torian must take into account such essential factors as administrative procedures bearing on the problem and background material relative to it.

It will be no easy task to bring together the mass of information which medical officers have accumulated and shape it into a unified historical presentation embodying chronological trends, changing conceptions, and proper evaluation and interpretation. But this is the stuff of which a real medical history is made.

Proper documentation is also of the utmost importance in compiling medical history. Authors are urged to make sure that their manuscripts include complete bibliographic data and that they be *accompanied by the basic documents* if practicable. It is obligatory that this be done, since documentation is the foundation on which the accuracy and validity of historical work is established. The Historical Division of The Surgeon General's Office has prepared a mimeographed statement on this subject in which the essentiality of documentation is discussed and directions given as to types of documentary evidence that may be used and how references to source materials are to be recorded in the history. Copies of this statement are available on request to the director, Historical Division, S.G.O., or to Medical Department historical officers in the various theaters of operations.

The Doctor in "The Scarlet Letter."—There is in Nathaniel Hawthorne's *Scarlet Letter* a description of the ideal doctor-patient relation which I should like to read to you. Speaking of the doctor, he says: "He deemed it essential, it would seem, to know the man before attempting to do him good. Wherever there is a heart and an intellect, the diseases of the physical frame are tinged with the peculiarities of these. In Arthur Dimesdale [the patient] thought and imagination were so active, and sensibility so intense, that the bodily infirmity would be likely to have its groundwork there. So Roger Chillingworth—the man of skill, the kind and friendly physician—strove to go deep into his patient's bosom, delving among his principles, prying into his recollections, and probing everything with a cautious touch, like a treasure seeker in a dark cavern. Few secrets can escape an investigator who has opportunity and licence to undertake such a quest and skill to follow it up. A man burdened with a secret should specially avoid the intimacy of his physician. If the latter possesses native sagacity, and a nameless something more—let us call it intuition; if he show no intrusive egotism nor disagreeably prominent characteristic of his own; if he has the power, which must be born with him, to bring his mind into such affinity with his patient's, that this last shall unawares have spoken what he imagines himself only to have thought; if such revelations be received without tumult, and acknowledged not so often by an uttered sympathy as by silence, an inarticulate breath, and here and there a word, to indicate that all is understood; if to these qualifications of a confidant be joined the advantages afforded by his recognized character as a physician—then, at some inevitable moment, will the soul of the sufferer be dissolved, and flow forth in a dark, but transparent stream, bringing all its mysteries into the daylight." (From Lord Horder's address delivered before the Cardiff Medical Society, 21 February 1945, and published in the *British Medical Journal*, 17 March 1945)

INJURIES AMONG MILITARY PERSONNEL IN THE UNITED STATES

In the Office of the Under Secretary of War, an Advisory Board on Fire and Accident Prevention was established in February 1944. The director of the Occupational Health Division of The Surgeon General's Office represented The Surgeon General on this board. A safety program for military personnel of the Army Service Forces in continental United States was inaugurated in June 1944. Under this program The Surgeon General was charged with assisting the Provost Marshal and the Director of Military Training in the determination of doctrine and in the preparation of text, manuals, and other aids for safety training as well as with maintaining data regarding the number, frequency, severity, and causes of injuries to military personnel. The latter functions have been handled by the Medical Statistics Division, The Surgeon General's Office.

Morbidity from injuries among military personnel in continental United States has recently been at record low levels, not only in comparison with previous war years but also in contrast with peacetime experience. During the first quarter of 1945, the admission rate from injuries was only about 50 per year per 1,000 as compared with more than 100 per 1,000 during the 1930's and about 80 per 1,000 for the three-year period 1942-1944. The recent decline in the injury admission rate is believed to reflect greatly curtailed training activities (in which the injury rate has been relatively high), increased emphasis on accident prevention, and a change in the definition of a reportable injury (29 September 1944) whereby readmissions for injury and injuries sustained prior to entry on active service were excluded. Despite this very favorable experience, injuries have recently accounted for about 7 percent of all the admissions among Army personnel stationed in this country and for about 20 percent of the noneffective rate among such personnel. Although admissions for injury have been relatively few, they have been responsible for an appreciable proportion of all noneffectiveness—reflecting the fact that the average time lost per injury is about three times as long as for disease.

The seriousness of injuries is also indicated by a consideration of the respective death rates from injury and disease. During 1944, the mortality rate from injury for U.S. Army personnel in the United States was estimated at 2.1 per 1,000 as compared with a mortality rate of 0.6 per 1,000 from disease. More than one-half the deaths from injury resulted from aircraft accidents. For this reason, the 1944 mortality rate from injury among Army Air Forces personnel was about 4 per 1,000 in contrast to about 1 per 1,000 for other Army personnel. While the mortality rate from injury has been much higher in the Army Air Forces than for other Army personnel,

the opposite situation has prevailed in regard to injury admissions. In recent months the injury admission rate for the A.A.F. has been about 10 percent lower than for the Army as a whole and correspondingly the injury admission rate for the Army excluding the Air Forces has been about 5 percent higher than for the Army as a whole.

Detailed data regarding injuries to military personnel of the Army Service and Ground Forces became available in the Office of The Surgeon General about the middle of 1944. These indicate that about 80 percent of all injury admissions have been sustained on duty, with the remaining 20 percent occurring while on leave, pass, furlough, or AWOL. About 10 percent of all injury admissions were accounted for by "casuals" or personnel away from their regular stations. Although attached personnel off duty and unattached personnel irrespective of duty status were responsible for only 25 percent of all injury admissions, deaths among such personnel accounted for more than one-half of all the deaths from injury. This reflects the fact that personnel off duty and casuals are frequently involved in transportation accidents which produce relatively many fatalities.

That morbidity from injury among personnel in training is markedly higher than for other Army personnel is evidenced by the admission rates for troops in training being reported to be more than twice those for other troops. Troops in training, while subject to higher morbidity from injury when on duty, have nevertheless experienced lower admission rates from off-duty injuries—probably because of closer supervision.

Wounds, fractures, or sprains (including strains and overexertion) represented more than 75 percent of all off-duty injuries among attached personnel; roughly, an equal proportion of cases was included in each of these categories. Burns (excluding sunburn) ranked next in importance, accounting for about 4 percent of all injury admissions. The following types of injury accounted each for about 1 percent of the total: blisters; effects of heat, cold, or exposure (reported principally during the summer months and the middle of the winter); inhalation or aspiration; and reactions to drugs, serums, or anesthetics[1] (reported chiefly by reception centers and staging areas). About 10 suicides per month have recently been recorded for personnel stationed in the continental United States.

1. Now classified with disease (see par. 28b, Change 4, AR 40-1080).

Ambulance Gliders.—A glider service was inaugurated in the European Theater in March to evacuate the wounded from Remagen, Germany. It is possible that gliders may almost eliminate ambulances for hauling our battle casualties long distances over shell-torn roads, giving them a faster, smoother ride to the hospital.

ACCIDENT PREVENTION PROGRAM

An accident prevention program was planned in the Southwest Pacific Theater, on 1 May 1944, and a suitably trained Sanitary Corps officer was assigned to headquarters as "accident officer." Commanders of all USASOS bases and units under their command were directed to appoint an officer to act as accident prevention officer in each command. These officers were charged with the responsibility of studying nonbattle injuries, formulating safety measures, and carrying out the program outlined. Pertinent data relative to the causes of nonbattle injuries, together with corrective measures to be instituted for their reduction, were prepared by Headquarters, USASOS, and disseminated through channels to all base and unit accident prevention officers. Accidents occurring within each unit were recorded and analyzed by base and unit accident prevention officers and immediate corrective and disciplinary action taken. The program was publicized by radio, lectures, news bulletins, signs, posters, slogan contests, moving pictures, and film strips. Emphasis was placed on measures to be taken for reducing the destruction and loss of vital equipment and supplies through carelessness and accidents.

The morbidity statistics of the theater show that the Accident Prevention Program in six months has been instrumental in saving 8 lives, the evacuation of 22 patients to the United States, and 1,125 man-days per day and 1,000 occupied hospital beds per day for the theater. Because of these satisfactory results, the Accident Prevention Program is to be continued indefinitely.

NEW PENICILLIN PACKAGE

Medical Department contractors are now producing a new item in Penicillin sodium, 200,000 Oxford units, in vial (Med. Dept. Item No. 1606810). The old item (Med. Dept. Item No. 1606800), which contained 100,000 Oxford units, is now limited standard. The new item requires no special attention from the user, except the recognition that it contains twice the quantity of penicillin sodium as the old item. Its purpose is to save refrigerated shipping and storage space and to decrease the time consumed in opening the many vials routinely used in large hospitals.

Practically all deliveries of penicillin sodium, both the old and new items, are made in rubber-stoppered vials of 22- to 25-cc. capacity. The new item, however, carries a distinctive label which emphasizes its difference from the former standard item. Solutions for the administration of penicillin sodium may be made by the addition of 10 cc. of saline or dextrose solution to the vial containing 100,000 Oxford units, or by the addition of 20 cc. thereof to the vial containing 200,000 Oxford units. It is essential, therefore, to know which penicillin item is being used, so the proper amount of solution may be added.

PENICILLIN IN TREATMENT OF INFLUENZAL MENINGITIS

A report[1] of the complete recovery from influenzal meningitis of a patient treated with penicillin intraspinally and penicillin and sulfadiazine intramuscularly suggests a further trial of this treatment, particularly in view of its simplicity and low cost in comparison with the use of specific rabbit antiserum as advocated by Alexander.[2]

This case was tentatively diagnosed bronchopneumonia. Later, definite signs of meningeal irritation developed. The patient, an infant, was acutely ill, lying in opisthotonos, temperature 103.6°, and all reflexes were hyperactive to clonic. Oral sulfathiazole, 2.5 grains every three hours, was given until discontinued on the ninth day because of vomiting. A spinal puncture on the eleventh day showed cloudy fluid with 3,300 cells, 85 percent of which were polymorphonuclear leukocytes. Then 20,000 units of penicillin were given intrathecally followed by 10,000 units intramuscularly every three hours for twenty-four hours, and another 20,000 units intrathecally on the twelfth day. The patient definitely improved during and after the twenty-four hours of penicillin treatment but still ran a septic course and developed a severe opisthotonos. On the twenty-third day, 5 percent sodium sulfadiazine intramuscularly, 24 grains daily, was given. Following the report on the spinal fluid of a pure culture of *Hemophilus influenzae* on the same day, 5,000 units of penicillin intrathecally twice daily and 5,000 units intramuscularly every three hours were given. (In the meantime, attempts were being made without avail to obtain specific rabbit antiserum.) After twenty-four hours, spinal fluid cultures showed definite decrease in the number of colonies and the temperature decreased to below 101° F. With the gratifying effect of intrathecal penicillin, the intraspinal route was discontinued on the twenty-seventh day after two spinal fluid cultures were negative. Two days later, the temperature again became septic and spinal fluid culture showed abundant growth. Penicillin (7,500 units) was again given intrathecally twice daily on the thirty-first day. The temperature then showed a gradual drop to normal for the first time, but a sudden elevation again occurred on the thirty-eighth day, although the spinal culture was negative. On discontinuing sulfadiazine, the temperature again reached normal. Penicillin intramuscularly was discontinued on the forty-second day although penicillin intrathecally was given once daily for two more days. The patient was discharged as cured about two weeks later. A daily follow-up by a nurse for a month and reexamination at the clinic on the fourth and sixth weeks following discharge showed no abnormal findings.

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1. Abstract of paper by Captain Chris G. Ronson, M.C., submitted through The Surgeon General's Office to the Journal of the American Medical Association.

2. Alexander, H. E.: Treatment of Haemophilus Influenzae Infections and of Meningococcic and Pneumococcic Meningitis, Am. J. Dis. Child., 66:172-187, Aug. 1943.

In this case sulfadiazine was never administered in sufficient dosage to get a proper blood level. The dramatic effects on the spinal cell count and culture by penicillin intrathecally led the author to believe that sulfadiazine played an insignificant part in the treatment. *Hemophilus influenzae* has been placed high in the list of bacteria resistant to penicillin; however, in this case is further evidence that the list of bacteria insusceptible to penicillin is becoming smaller and that the true bactericidal power of this drug has yet to be determined

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A CASE OF COCCIDIOSIS

A case of *Isospora hominis* infection in a soldier in New Guinea has been reported by Captain A. S. Albritton, M.C., and Technician Fourth Grade W. E. Fitzwater. Oocysts of *I. hominis* were demonstrated in stool specimens on two occasions and development of two sporoblasts within the oocysts was noted. The patient was admitted with a chief complaint of epigastric distress and gave a history of an intermittent diarrhea for one month prior to admission. A saturated solution of sodium chloride was satisfactory for flotation of the oocysts. The organisms disappeared from the stools following two treatments with tetrachlorethylene; however, because of the self-limited course of *Isospora* infections in man, no definite conclusion may be drawn concerning the efficacy of the drug.

Room for sterile surgical supplies at a U. S. evacuation hospital in France.

CENTRIFUGE TECHNIQUE IN AGGLUTINATION REACTIONS

Centrifugation has been used for many years as an aid in the identification of certain bacteria,[1] to demonstrate agglutinin-binding by spontaneously sedimenting antigens,[2] and in hastening agglutination reactions.[3] A study has been reported[4] recently on the centrifuge technique as a screening and diagnostic procedure for the "fevers of unknown etiology" (typhoid-paratyphoid and typhus, tularemia, and brucellosis), as well as for the rapid serum-conserving identification of certain organisms. The same stock antigens suspension serves for both screening and titration and the entire procedure may be accomplished in a matter of minutes with less than a milliliter of the patient's serum. The methods described have been applied to 2,961 consecutive serum samples submitted for agglutination tests to a central Army laboratory. All sera were tested with six antigens, regardless of the specific information requested. The centrifuge technique was found to be an economical, efficient system for the serological identification of many bacteria. Centrifugation at 2,000 r.p.m. for seven minutes was found also to be an efficient, time- and material-conserving method for performing diagnostic agglutination reactions. Single serum dilutions were adequate for screening human sera for reactors with the following antigens: *Eberthella typhi, Salmonella paratyphi* A and B, *Bacillus abortus, Pasteurella tularensis,* and *Proteus* OX 19.

COMMITTEE TO AID PROGRAM FOR THE BLIND

An honorary civilian advisory committee to The Surgeon General has been formed to cooperate in the Army's social adjustment training program for the blind. All members of the committee are prominent in civilian work for the blind. At the first meeting on 21 March, Dr. Robert B. Irwin, New York City, was elected chairman, and Mr. Joseph G. Cauffman, Overbrook, Pennsylvania, secretary; Mr. Peter J. Salmon, Brooklyn, New York, Mr. W. L. McDaniel, Washington, D. C., and Mr. Henry P. Johnson, Tampa, Florida, were elected field consultants. Those constitute the executive committee. Other members of the advisory committee are: Dr. Gabriel Farrell, Watertown, Massachusetts; Mr. Eber L. Palmer, Batavia, New York; Colonel E. A. Baker, Toronto, Canada; Mr. Philip N. Harrison, Harrisburg, Pennsylvania; Dr. Roma S. Cheek, Raleigh, North Carolina; Rev. Thomas J. Carroll, Newton, Massachusetts; and Mrs. Lee Johnson, Jefferson City, Missouri.

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1. Gaehtgens, W.: Acceleration of Agglutination by Means of Centrifugation, with Special Consideration of Meningococcus Agglutination, Arch. Hyg., Munch., 66:377-383, 1908.
2. Mudd, S.: A Simple Reaction for Detecting the Binding of Agglutinins by Difficultly Agglutinable Suspensions, J. Immun., Balt., 13:113-121, Feb. 1927.
3. Gaehtgens, W.: Contribution to the Technique of Agglutination, Arbeiten aus dem kaiserlichen Gesundheitsamte, 25:218-222, 1907.
4. Paper by Major Harry A. Feldman, M.C., A.U.S., submitted through The Surgeon General's Office to the Journal of Immunology.

CENSUS OF HOSPITALS IN THE UNITED STATES

The annual census of hospitals, sanatoriums, and related institutions, conducted by the Council on Medical Education and Hospitals of the American Medical Association,[1] contains the names of 6,611 such institutions in the United States registered by the Association and 131 in Alaska, the Canal Zone, Hawaii, Puerto Rico, and the Virgin Islands. This number compares with 6,655 registered in 1943. The reduction in the number of hospitals, however, is not accompanied by a corresponding loss in bed capacity; in fact, the construction of new units and the expansion of existing services resulted in a net gain of 80,691 beds, the greatest increase being in the Federal group, which now has 551,135 beds, or 74,462 more than the number reported in 1943. The present capacity in all registered hospitals is 1,729,945 beds.

The most striking feature of the report, *The Journal* states, is the continued expansion of inpatient hospital care as shown by the unprecedented total of 16,036,848 admissions in 1944 exclusive of newborn infants. The tremendous task which the hospitals have assumed under wartime conditions is further indicated in the daily patient load. Measured over a yearly period, the present average of 1,299,474 represents a record total of 475,607,484 patient-days. Hospital births registered their highest number in 1943 when 1,924,591 were reported in the hospitals registered by the Association. The present survey shows a reduction of only 4,615 births, a particularly significant figure when compared with an increase of more than 250,000 in each of the two preceding years.

The average bed occupancy has increased in all divisions of the nongovernmental hospitals, whereas decreased rates were noted in governmental groups except state institutions. The latter are devoted mainly to psychiatric service in which long-continued treatment and custodial care are involved. In the Federal groups, the decrease may be attributed mainly to the continued expansion in the number of general hospital beds and the necessity of maintaining a reserve supply in anticipation of future needs. General hospitals as a group show a decrease of one-half day in average length of stay per patient. The principal gain was in the Federal division in which the average period of hospitalization increased from 20.3 to 22 days. In other governmental groups there was a slight decrease except in state institutions. The church-related hospitals and other nonprofit organizations continued to report an average length of stay of 9.8 days.

In the same issue of *The Journal* is the annual report on Technical Personnel in All Hospitals. It appears that an enormous increase has occurred during the war years in the number of technicians in hospitals, which closely parallels the increase in bed capacity and total admissions since 1941. Two

1. Editorial, page 855, J.A.M.A., 31 March 1945.

problems are paramount. Those now employed who have not had the benefit of satisfactory instruction must receive additional training; and approved schools must produce sufficient graduates to supply hospitals and other employers with the normal increase in personnel and replacement of those no longer serving as technicians. The second problem, increasing the number of graduates, is more difficult to solve. The magnitude of the problem appears when a comparison is made of the increased employment of technical personnel with the annual graduates of approved schools. In two important divisions increased employment has noticeably lagged behind the increase in annual admissions. Occupational therapists have been increased only 20 percent over the 1941 report and physical therapists only 28 percent, while the increase in bed capacity has been 30.6 percent and in total admissions 38.3 percent in the same period. Hospitals are in need of comparatively larger numbers of occupational and physical therapists.

THE NEW IMPROVED AMBULANCE

Twenty-five new ambulances that will carry three times as many wounded men as those now in use are in production and will be in use within a short time. This improved ambulance will be used to carry wounded soldiers from ships and planes to Army hospitals. It accommodates twelve litter cases, has far better riding qualities, and allows more room for attendants to care for the wounded while en route. This, and larger ambulance, will also save on personnel, tires, and gasoline. It is a one-ton automobile with front wheel drive which allows the bed of the truck to be placed lower, making it easier to get patients in and out of the ambulance. In appearance, it is somewhat like a city bus, although smaller. Driver, attendants, and patients are all inclosed. It has a heater and an air circulation system. At the request of The Surgeon General, the Ordnance technical staff collaborated with the Army Medical Department in designing the new ambulance.

Seminar at Institute of Pathology.—At the weekly seminar at the Army Institute of Pathology, Washington, D. C., 21 April, Lieut. Colonel A. O. Hammond, director of roentgenology, Walter Reed General Hospital, discussed "Pulmonary Embolism and Infarction."

POSSIBILITY OF FOOD POISONING BY CLOSTRIDIUM PERFRINGENS (CL. WELCHII)

In a recent communication[1] attention was drawn to the possibility that *Clostridium perfringens* (*Cl. welchii*) may produce an enterotoxin to which humans are sensitive when the organism is the spoilage agent of freshly-cooked chicken. Outbreaks of food poisoning believed due to this cause have occurred in which chicken broth used in the preparation of various dishes was used on the day following the preliminary cooking. In most instances, the broth was obtained by a prolonged steaming of the fowl in an aluminum steam jacketed pot or in deep pans. It is believed that the organism, which is usually present on chickens following dressing, survived the heating process by virtue of protection within the fat and was able to grow during the cooling period, even though refrigeration was available and used. It is apparent that large kettles of broth require several hours to cool to a temperature which will prevent growth of the organism. In all samples the causal organism had grown to a stage where direct microscopic smears revealed a large number of gram-positive blunt rod forms. This test, together with isolation of the organism following enrichment in Brewer's thioglycollate broth or litmus milk with reduced iron, should be used in the examination of suspected samples.

Because of the well-known wide distribution of this organism, it is probable that the mere finding, by laboratory culture methods, of *Cl. perfringens* in a food sample is not sufficient to incriminate the sample. In food poisoning outbreaks, in which there are symptoms similar to those given below, the microscopic and cultural tests should, however, include procedures to reveal this organism.

The most pronounced symptom in the individuals involved was a profuse diarrhea of several hours' duration, starting about 8 to 12 hours following the meal. Nausea and abdominal cramps were frequently noted; vomiting occurred less often. Most individuals were able to continue with normal activity. There is evidence to indicate individual susceptibility within a group eating the same food; repeat attacks in the same individual have been noted. To date, the only food implicated has been dishes prepared from chicken (a la king, chicken chop suey, pie, patties, etc.) in which broth was used. In the single instance traceable to a beef stew, it is believed that use of chicken broth in the preparation of the stew accounts for the contamination. Samples of the food in various outbreaks were shown to be free of the usual food poisoning organisms and, in one instance, a human volunteer became ill with typical symptoms following the eating of a chicken croquette which had been shown to be heavily contaminated with *Cl. perfringens* but to be free of other types.

1. Unpublished data of Professor L. S. McClung, Indiana University, Bloomington, Indiana.

EDUCATIONAL OPPORTUNITIES FOR ARMY DOCTORS

During World War II, as of 15 April, more than 6,000 selected medical officers had been graduated from short, intensive courses given by the Medical Department in some thirty critical medical and surgical specialties. In addition, refresher courses in general medicine and surgery give medical officers a chance to brush up before returning to professional assignments after other duty. Many doctors benefit also while in service from working under key professional personnel in military hospitals. Other medical officers who have been on duty with combat troops are given an opportunity to brush up on their specialty through the rotation policy. Professional training of medical officers during military service, obviously, must be restricted to meet military rather than civilian requirements. However, The Surgeon General is keenly interested in the welfare of these doctors and will provide so far as possible opportunities for professional training.

In the postwar period, all doctors will be entitled to professional training after their release from service, under the G.I. Bill of Rights, and those who remain in the Army will have the opportunity for refresher training at selected military hospitals and civilian schools.

POSTGRADUATE WISHES OF MEDICAL OFFICERS

The future educational desires of 21,029 medical officers on duty with the Army, Navy, Public Health Service, and Veterans' Administration have been carefully analyzed by the Committee on Postwar Medical Service of the American Medical Association and the liaison officer to The Surgeon General's Office. The committee, with the assistance of the surgeons general, distributed questionnaires to each medical officer on duty, and those that were returned are analyzed in their report.[1] The questionnaires were divided into six groups on the basis of date of graduation from medical school. The percentage of returned questionnaires from the various graduation groups closely approximated that of medical officers on active duty in the different groups. Previously, a pilot questionnaire[2] had been mailed to 3,000 medical officers on duty with the armed forces during February and March 1944. The conclusions from the more recent study were in part as follows.

Nearly 60 percent of the group, or 12,534, wanted to take long courses of further training in hospital or educational work. Courses of six months or longer were called long courses; courses under six months were called short courses. About one-fifth of the group, or 4,563, indicated that they

1. Leuth, Harold C.: Postgraduate Wishes of Medical Officers, J.A.M.A., 127:759-770, 31 March 1945.

2. Results of Pilot Questionnaire to Physicians in Service, J.A.M.A., 125:558-560, 24 June 1944.

wanted to take short courses. Those officers who did not want any future training numbered 3,922, or 18.7 percent of the group.

Requests for short courses included all specialties. The largest numbers of requests were made for the following specialties in order of frequency: internal medicine, surgery, general review, obstetrics and gynecology, pediatrics, otolaryngology, and ophthalmology. The ten most popular special fields of training by means of long courses were, in order of frequency of request, surgery, internal medicine, obstetrics and gynecology, general review, psychiatry and neurology, pediatrics, orthopedic surgery, ophthalmology, radiology, and otolaryngology.

Nearly two-thirds of the group, or 13,333, expressed a desire to become certified specialists. Of the entire group, 3,324 medical officers, or nearly 16 percent, had already been certified by the American specialty boards. The remainder of the group either did not care to be certified or did not mention their desires. Nearly 40 percent of the medical officers (8,734) came from private practice to the military services. Twenty-two percent came directly from internships (4,640), nearly 10 percent came directly from residencies (2,191), and the remainder came from other types of practice. About 15 percent failed to answer the question concerning their previous type of medical practice.

The results of the pilot questionnaire and of the present questionnaire were compared. Long courses were requested by about one-fourth more men in the final questionnaire than in the pilot questionnaire. Only two-thirds as many men requested short courses in the final questionnaire as in the pilot. The difference was attributed to a change in point of view of medical officers during the interval between the circulation of the questionnaires. The Committee on Postwar Medical Service is now engaged in a study that will determine available places at which further training can be given.

Veterinary personnel inspect frozen poultry and frozen lamb at cold-storage plant in Paris to ensure that the products are safe for issue to troops.

IMPROVED CLASSIFICATION RECORDS

A classification questionnaire for each officer of the Medical Department is now on file in The Surgeon General's Office as a result of the annual review of classification. In keeping with the provisions of paragraph 5*c*, War Department Circular No. 460, 1944 classification questionnaires have been coming in to The Surgeon General's Office from many of the theaters, independent commands, major forces, and zone-of-interior installations.

An improved method of processing the recently received questionnaires with the older records of The Surgeon General's Office makes it possible to have the latest available information contained on the classification questionnaire on file. This will permit a better utilization of medical officer skills in relation to the needs of the Army, will facilitate proper assignment of officers, and will be helpful in determining the level of future professional training.

Classification of questionnaires of dental officers are being currently reviewed by representatives of the Dental Division in connection with accepted classification procedures. A uniform system of grading dental officers is being perfected and will soon be in full operation. Appropriate notations of skill in administrative duties are made so that such dental officers can be properly classified on the basis of their administrative capabilities. Representatives of the Veterinary Division in conjunction with the Classification Branch are reviewing their standards and methods of classification so that they, too, will closely parallel those currently in use for Medical Corps officers.

FEBRUARY TO MAY WAC RECRUITING SUCCESSFUL

The February to May recruiting campaign for Women's Army Corps hospital technicians was completed almost a month ahead of schedule, and, in point of time, numbers, and qualifications required, was one of the most successful recruiting efforts so far in this war for a specific type of Army personnel. Completion of the program in slightly over two months is even more significant, in that qualifications for enlistment are necessarily high for personnel who must be given technical training in a short period of time.

This program had the support of the American Red Cross, Office of War Information, War Advertising Council, national and local advertisers, and all advertising media. General of the Army George C. Marshall, Chief of Staff, called upon the governors of states in January to lend support to this recruiting effort. Their response to his appeal was immediate and unanimous.

The War Department emphasized in announcing the suc-

cessful completion of the program that it would be necessary to continue recruitment and training of administrative and technical WAC personnel; however, all recruiting after 1 May will be for general assignment, which means that the woman who enlists will be assigned on the basis of the classification given her at the training center and the needs of the service as they arise. She will be classified according to her skills and aptitudes, but for whatever branch of the Army and at whatever post she may be needed. The demand for WACs is expected to continue heaviest in administrative and hospital work, but additional numbers will be required from time to time in virtually all branches of the Army.

The growing requirements for administrative and technical personnel have necessitated the merger of Women's Army Corps recruiting stations with regular Army recruiting offices. The Army faces, therefore, the job of recruiting large numbers of WACs, but with a reduced recruiting staff and with recruiting offices in only major cities.

RESULTS OF EXAMINATIONS FOR APPOINTMENT TO THE NURSE CORPS

The urgent need for additional nurses to ensure adequate care of wounded and sick Army personnel has focused attention on the physical standards for the Army Nurse Corps (AR 40-100). A study was made in The Surgeon General's Office of the results of 2,841 medical examinations of applicants for appointment to the Army Nurse Corps. These examinations were completed mostly in February and March 1945. Of the 2,841 nurses examined, 1,320 were accepted for general service, 553 for general service subject to waivers of physical defects, and 491 for limited service subject to waivers of physical defects. Those rejected numbered 491. Thus, about 66 percent of the applicants were accepted for general service and 17 percent for limited service with waivers. About 17 percent were rejected. The rejection rate for Army nurse applicants increased with advancing age from 10 percent in the age group, 20 to 24, to 48 percent in the age group, 40 to 44.

More than one-half of all the applicants were under 25 years of age. The two service commands which had the highest percentages of applicants under 25 years of age showed the lowest rejection rates. The high rejection rate for applicants 40 to 44 years of age supports the wisdom of not accepting women over 45 years for the Army Nurse Corps.

The most important causes of rejection were cardiovascular defects, weight, gynecological defects, and tuberculosis, in this order. Each accounted for about 13 percent of all rejections. The majority of the cardiovascular defects were heart conditions, but about 25 percent were cases of hypertension. Of the rejections for weight, two-thirds were for overweight

and one-third for underweight. Musculoskeletal defects and endocrine disorders were the next most important causes of rejection, each accounting for about 6 percent of all rejections. About one-third of the rejected applicants had more than one disqualifying defect.

Among candidates accepted for limited service, defective vision was by far the most important defect requiring waiver; it represented 63 percent of all the waivers for limited service. Weight (about equally divided between over- and underweight) was the next most important defect requiring waiver for limited service and it accounted for nearly 20 percent of the waivers.

Among candidates accepted for general service, waivers were granted preponderantly for weight (about 70 percent of all waivers). The next most important conditions requiring waiver for general service were dental defects, which represented about 5 percent of all waivers. Dental defects not requiring waiver were found in about one out of every four Army nurse applicants accepted for general service without waiver. Defective vision was similarly recorded in about one out of every eight accepted candidates. Minor nondisqualifying cardiovascular defects (largely varicose veins) were noted in about 6 percent of the cases accepted for general service without a waiver.

U. S. Army nurses liberated from Jap prison camps in the Philippines being evacuated to the homeland from Leyte. Army Air Forces photograph.

ACUTE HIGH ALTITUDE ANOXIA

Fatalities from lack of oxygen during bombing operations at high altitude afforded an opportunity to study the gross and microscopic anatomy of acute anoxic anoxia in man as it occurs at low atmospheric pressure. Twenty-seven necropsies were performed in one hospital on members of bomber crews whose deaths had been attributed to anoxia by the Air Force medical officers who investigated the cases. In no instance was the analysis of the history complicated by the presence of wounds, and in no case history was a rapid ascent to high altitude recorded. Although the possibility of fatal air embolism was not considered likely at the altitude at which death occurred, search for intravascular gas in the right ventricle and in the mesenteric veins was made in sixteen cases. None was found. In general, the casualties occurred at altitudes of 24,200 to 31,500 feet, but the precise level at which difficulty was encountered could not be determined in many cases, because the exact time of death was not always known by crew mates.

The vascular system in fatal cases of acute high altitude anoxia shows varying degrees of congestion in the pulmonary and systemic circulations and in different organs within the systemic circulation. Pulmonary congestion occurred in all but one, was slight and patchy in some, and was severe and diffuse in others; in most cases it was extreme in the viscera of the systemic circulation. It would seem reasonable to expect that such pooling of blood in the visceral capillaries might result in arterial pressure. Dilatation of the right ventricle, systemic veins, and veins of the portal system indicates passive congestion to be a factor in capillary hyperemia in a high proportion of cases. Loss of fluid from the capillaries was demonstrated by edema of the lungs, myocardium, renal medulla, gastrointestinal tract, and lymphoid tissue. Swelling of the endothelial cells of capillaries of the renal medulla indicates damage to such cells. Because of the severe passive congestion and the fact that the blood passes through capillaries of the glomeruli and cortex before reaching the medulla, it is reasonable to assume that the oxygen tension in these vessels was extremely low.

About one-half the necropsies revealed epicardial or aortic hemorrhage. Their location at these sites indicates a mechanical factor in their production. Hemorrhages elsewhere were usually small and sporadic. An exception was in the loose tissue of the cortex of the thymus, which usually was conspicuously congested and edematous as well as hemorrhagic. The consistency of the occurrence of small hemorrhages in the middle ears and mastoid cells strongly suggests that this may be due, in part, to the effect of low pressure. When they occurred in the eustachian tube, they were limited to the rigid bony segment near the middle ear. No hemor-

Abstract of an article by Captain Robert A. Kritzler, M.C., A.U.S., published in War Medicine, December 1944.

rhages were observed in the soft pharyngeal portion, which would collapse as external pressure increased during descent. In descent after death at high altitude a vacuum develops in the middle ear and in contiguous cavities because the increasing external pressure on the soft segment of the eustachian tube is unopposed by voluntary action. It is possible that such a postmortem vacuum causes a rupture of congested capillaries damaged by anoxia.

The presence of fat-free and glycogen-free vacuoles in various parenchymal cells of highly specialized tissues in cases of acute high altitude anoxia and in cases of death due to the anoxia caused by acute carbon-monoxide poisoning and their relative absence in corresponding tissues in cases of sudden death strongly indicate anoxia as a cause. Their occurrence in large numbers in the left ventricle and in the central zones of the hepatic lobules supports this interpretation. Little can be said about the chemical nature of the vacuoles at present. The evidence is that they contain fat-free and glycogen-free aqueous fluid which appears homogeneous in unfixed preparations. When fixed, the vacuoles appear as clear spaces or faintly staining structures containing small inclusion particles. This suggests that some material in the vacuole fluid is coagulated by the fixative and hence may be partly protein. The difference in staining characteristics of those in the liver and pancreas from those in other organs indicates a qualitative variation in the composition of the vacuole fluid in different organs.

In summary, widespread, severe capillary congestion was found and was conspicuous and most constant in the pulmonary, renal, intestinal, and cerebral capillaries. The skeletal muscle did not have this congestion. In a high proportion of cases the systemic venous and the portal circulations showed gross and microscopic congestion and the right ventricle was dilated. There was wide individual variation in the incidence, location, and amount of edema and hemorrhage. An exception to this was the consistent occurrence of hemorrhage in the thymus and in the middle ears. Swelling of endothelial cells of capillaries of the renal medulla was observed. The presence of fat-free and glycogen-free vacuoles previously described in the myocardium and liver and less frequently in cells of other organs was confirmed. These vacuoles occurred with equal frequency in cases of anemic anoxia (acute carbon-monoxide poisoning) but were rarely found in the tissues in nonanoxic control cases.

Public Address Systems.—The Commanding General, Army Service Forces, has directed that public address systems standardized by the Signal Corps be installed and maintained in all permanent general hospitals where such systems are not now established.

BRIGADIER GENERAL WILLIS

Brigadier General John M. Willis, born in Virginia on 25 November 1886, and now surgeon, Headquarters, Pacific Ocean Area, was appointed a first lieutenant in the Medical Reserve Corps on 12 August 1910. He has since served on the Mexican Border, in the Philippines and Hawaii, as executive officer at Fitzsimons General Hospital, and, at different times, as a member of the faculty, secretary, and director, department of administration, and assistant commandant at the Medical Field Service School, Carlisle Barracks, Pennsylvania. General Willis was in command of the Medical Replacement Training Center, Camp Grant, Illinois, 1941-1943, then was assigned as surgeon of the Ninth Service Command with headquarters at Fort Douglas, Utah. He is a graduate of the Army War College, Command and General Staff School, Army Medical School, Medical Field Service School, and Chemical Warfare School, Field Officers' Course. He attained his present rank on 5 April 1941 and his present assignment in November 1944.

Dentures Constructed.—Only 2 new dentures were constructed in continental United States per 1,000 men per month during January 1942. One year later, the rate had increased to 8.3; two years later it was 16.2, and in January 1945, it was 14.9. An all-time high was recorded during April 1944 of 19.95. The overseas rates started at 1.5 and advanced to 4.7 by March 1944. The overseas figures during the past year have been about 4 per 1,000 per month.

During 1942 about twice as many partial dentures were made (total Army) as full dentures, and by January 1944, the partial denture load had doubled. In January 1944 (total Army), about 2.20 full dentures were constructed per 1,000 men per month as compared to 9.71 partials. During the last quarter of 1944 (total Army), the rates were reduced to 1.9 full dentures and 7.58 partial dentures per 1,000 men per month.

RECENT DIRECTIVES AND PUBLICATIONS

This list is intended as only a brief reference to the items mentioned. Before acting on any of them, the original communication should be read. Request for copies, when made, should be directed to source of communication through proper channels.

ASF, Headquarters Circular No. 89 10 Mar. 45 Part II, Sect. II — Transfer. Prompt movement of patients evacuated from overseas, from debarkation hospital where initially received, direct to medical installations having necessary facilities for proper treatment, is desirable to save personnel and transportation facilities and maintain morale. Establishes system of reporting such patients, which system will make available information required to accomplish prompt movement of such patients.

AR 40-75 C 1 27 Feb. 45 — Ambulances. Provides that sirens and red lights will not be procured for installation on metropolitan or field ambulances, except those regularly assigned to airplane crash duty under Commanding General, A.A.F. Such warning devices to be operated only in connection with crash rescues. Station commanding officers to take action to prevent unnecessary use of such warning devices.

WD Circular No. 64 28 Feb. 45 Sect. VII — Hernia. Sets forth detailed instructions and establishes policies re assignment and disposition of military personnel with hernias.

WD Circular No. 69 3 Mar. 45 Sect. III — Oversea Replacement. Commanding officers selecting officers for oversea assignment as replacements to select only those with efficiency rating of "very satisfactory" or better. No officer with "unsatisfactory" rating during preceding six months to be considered.

ASF, Headquarters Circular No. 74 28 Feb. 45 Part II, Sect. III — Psychiatric Patients. Individuals with psychoneurotic disorders will not be confined in locked wards for purpose of observation unless some special indication, such as suicidal tendencies, justifies such treatment. Patients admitted to psychiatric wards to be examined by a psychiatrist within twenty-four hours.

ASF, Headquarters Circular No. 74 28 Feb. 45 Part II, Sect. VI — Secretary of War has approved use of Army personnel to assist Veterans' Administration (par. 1e, sect. V, W.D. Cir. 427, 1944). Such personnel divided into two categories: (1) enlisted detachments; (2) professional services (medical, dental, administrative, and adjudication officers). Sets forth detailed procedures and policies to be observed in connection with such utilization of Army personnel. Rescinds several previous directives.

WD Circular No. 77 10 Mar. 45 Sect. II — Sulfanilamide. Only medical officers will apply sulfanilamide powder to wounds. First-aid packets containing sulfanilamide will not be considered unserviceable. Lists three types of first-aid packets authorized for use overseas. Instructions in first aid to conform to provisions set forth.

ASF, Headquarters Circular No. 92 14 Mar. 45 Part I, Sect. I — Paratroops. Active program to be established in A.S.F. to obtain applications from Medical, Engineer, and Signal Corps officers and enlisted men for voluntary transfer to A.G.F. for training in paratroop duty. Qualifications of enlisted men prescribed in listed directives. All commanders to bring this need for volunteers to attention of all qualified personnel.

AR 345-400 C 1 14 Mar. 45 — Morning Reports. Changes AR 345-400, 3 Jan. 1945. Provides that personnel reported as attached unassigned or attached on morning reports for units listed will be recorded in total only. List includes detachments of patients and separation centers.

AWARD OF THE SILVER STAR

The War Department has announced the award of the Silver Star to the following Medical Department personnel:

STAFF SERGEANT ROBERT J. REED, of Canandaigua, New York: On 12 September 1943 at Mount Chiunza, Italy, he served as a litter bearer, carrying wounded to the battalion aid station, making numerous trips under intense enemy fire.

STAFF SERGEANT LLOYD W. WILCOX, of Timber Lake, South Dakota: When the rear of his battalion column, which was moving forward in Italy, in November 1943, was subjected to an intense enemy artillery concentration, he, a medical aid man, collected the scattered members of the aid station and directed the litter bearers to the temporary aid station. Then, because his group had lost contact with the moving column, he crossed through an area subjected to heavy enemy artillery fire, and later led a vehicle on two trips over an unreconnoitered road to evacuate wounded men. He worked throughout a night of almost continual shelling, and his work was instrumental in saving the lives of three wounded and establishing contact between the medical aid personnel and the battalion.

SERGEANT SYLVESTER A. SAMMARTINE, New York: For gallantry in action from 23 April to 4 May 1943, near Mateur, Tunisia. During this period, he led and supervised the evacuation of the dead and wounded of his battalion. The evacuations were effected under the most difficult conditions of mountainous terrain, heavy mortar and artillery fire and through mine fields around Djebel Salama, Tunisia. Whenever the occasion arose for litter bearers, with utter disregard for his personal safety he volunteered to lead all squads.

TECHNICIAN FOURTH GRADE THOMAS H. PRUDHOMME, of Natchez, Louisiana: On 12 September 1943 at Mount Chiunza, Italy, he served as a litter bearer, carrying wounded to the battalion aid station making numerous trips under intense enemy fire.

CORPORAL JAMES B. ANDERSON, of Blytheville, Arkansas: On 20 March 1944, at Rossun Village, Manus Island, Admiralty Group, while serving at an aid station in support of attacking troops, he learned that in the intensity of the fire fight wounded men had not been treated or evacuated. Without hesitation and entirely on his own volition he left the comparative safety of the aid station, advanced to forward positions occupied by our troops, and, observing a wounded soldier lying between the advanced elements of our lines and the enemy positions, crawled forward through intense fire to reach the wounded man, provided first-aid measures, and then removed him to safety. His heroism in going to the aid of the wounded is worthy of the highest traditions of the medical service and his disregard of danger and his devotion to the ideals of his service were an inspiration to the troops.

PRIVATE FIRST CLASS RUSSELL L. HORN, McKinney, Texas, attached to a field artillery observation battalion in Italy. Although wounded, he refused to accept medical aid or to leave the area until he had dressed the wounds of his injured comrades and directed their evacuation, making certain that they had been rescued.

FIRST LIEUT. ROBERT C. KROHMER, M.A.C. (posthumous), awarded by the Commanding General, 43d Infantry Division: For gallantry in action against the enemy on 13 January 1945, during an assault on Hill 580, Luzon, Philippine Islands. Lieutenant Krohmer, together with the litter squad leader and litter bearers, in utter disregard for his own safety, advanced to render medical aid and evacuate the wounded from the front lines, under heavy enemy mortar, artillery, and small arms fire. In so doing, Lieutenant Krohmer sacrificed his life.

Coast Guardsmen transfer a wounded Marine to landing barge during the battle of Iwo Jima. The patient was then taken to an LST serving as a hospital ship out of gun range. Coast Guard photograph.

The twenty-five-day struggle for Saipan cost in Marine casualties three times those of the battle of Tarawa. A Navy corpsman administers plasma to a wounded Marine while another waits his turn. Marine Corps photograph.

No. 89

One Hundred and First Airborne Division passes in review after receiving Presidential Citation from General Dwight D. Eisenhower, Supreme Allied Commander.

Correspondence

BRITISH SURGEON GENERAL PRAISES U. S. AIRBORNE MEDICAL SERVICE

The Surgeon General of the Royal British Army, Lieut. General Sir Alexander Hood, in a personal letter to The Surgeon General of the U. S. Army, Major General Norman T. Kirk, praised highly the personnel and equipment of the U. S. airborne medical service of the 82d and 101st Airborne Divisions. General Hood also quoted from a report made to him by the Deputy Director of the Medical Services of the British Airborne Forces, as follows:

"The opportunity of observing the work of the medical services of the U. S. airborne divisions was of great interest. I was very favourably impressed by the high professional and administrative standard which was attained, and, above all, by the loyal cooperation which I received at all times from the surgeons of the two divisions. There was a complete absence of 'bellyaching' and an atmosphere of determination to overcome all difficulties and to ensure that everything that medical skill and intelligent forethought could provide was available for casualties."

WRECKED WATER AND SEWER SYSTEMS

Letter from a Sanitary Corps officer in a Pacific Theater to the Director of the Sanitary Engineering Division of The Surgeon General's Office.

I just wanted to drop you a line to let you know how we're doing here. I'm assigned to the Engineers to assist in rehabilitating a large water and sewer system. Got here on 6 February, have worked all night and day—several times—and have been shot at with everything from 5-inch to sniper fire. I got out to the filter plant the day after it was captured. The taking of the plant and appurtenances took place at 7:00 p.m. It was scheduled to be blown at 7:30—what luck! They took out 1,500 lb. TNT. Shellfire damaged one pump and switch panel. They blew the aqueduct

in three places, four main line gate valves, part of a covered reservoir. With all bridges blown in the city, the whole south side is shut off, but we've got an old siphon we're putting back into service—they missed that.

There is much damage to service connections due to widespread fires and shelling. Few large buildings are standing. The water went out of the system entirely on 9 February. We had continuous pressure back in the north side on 24 February. My job is to get the Metropolitan Water District on its feet and generally supervise filter plant and system in city. Thirty-six of the former employes have reported and we have set up a temporary office in which I have a desk. They are taking hold in good shape but are handicapped by loss of supplies, equipment, and vehicles. I am furnishing those from Army sources. The sewerage system was not greatly damaged. There are three lift stations on the north side all O.K. However, the whole system will run by gravity without pumping (electricity was off for about twenty-two days and now only restored to pump station on north side, filter plant, and a few essential purposes) but of course many of the sewers were surcharged. I am making a survey tomorrow, if the snipers will let us, of four lift stations on the south side. We've had to work with guards and several mornings had to chase the "Nips" out of our gravel pit before getting gravel out.

The filter plant is modern and compares very favorably with ours in all respects. City is about 60 percent watered and only 40 percent is sewered. Before 3 February, unaccounted-for water ran about 25 to 30 percent of total delivered—hardly any maintenance for the last three years. "Nips" took all vehicles and removed all catch basin gratings and now they are full of everything under the sun, including dead Japs.

I've been recuperating from a fall off an aqueduct but am feeling fine now. We are nicely "situated" in the undamaged and completely furnished German embassy until we get kicked out.

MOSQUITOES ON OKINAWA

Condensation of a dispatch from Ernie Pyle,[1] published in the Washington Daily News, 19 April 1945. By permission.

OKINAWA—That was one of the most miserable damn nights out of hundreds of miserable nights I have spent in this war. Bird Dog and Gross and I turned into our sacks just after dark. So did everybody else who wasn't on guard. It was too early to go to sleep so we just lay there in the dark and talked.

We didn't take off our clothes, of course; nobody does in the field. I did take off my boots, but Bird Dog and Gross left theirs on, for they had to stand watch on the field telephones from 1 till 2 a. m. The three of us lay jammed up against each other, with Bird Dog in the middle. We smoked one cigaret after another.

Right after dark the mosquitoes started buzzing around our heads. These Okinawa mosquitoes sound like a flame thrower, but after a while the hillside grew silent, and the hours went past. By an occasional slap at the mosquitoes each of us knew the others weren't asleep.

Suddenly Bird Dog sat up and pulled down his socks and started scratching. Fleas were after him. For some strange reason I am immune to fleas. But I'm the world's choicest morsel for mosquitoes. And

1. Killed on 18 April by Japanese machine-gun fire.

mosquito bites poison me. Every morning I wake up with at least one eye swollen shut.

That was the way it was all night—me with a double dose of mosquitoes, all the rest with a mixture of mosquitoes and fleas. You could hear marines hushfully cussing all night long around the hillsides. Suddenly there was a terrible outburst just downhill from us and a marine came jumping out into the moonlight, cussing and jerking at his clothes. "I can't stand these goddam things any longer," he cried. "I've got to take my clothes off."

We all laughed under our ponchos while he stood there in the moonlight and stripped off every stitch, even though it was very chilly. He shook and brushed his clothes, doused them with insect powder and then put them back on.

This unfortunate soul is nicknamed Pop, since he is 33 years old. After Pop went back to bed everything became quiet for several hours, but hardly anybody was asleep. One of the boys on guard came to wake my bedmates at a quarter till 1, but they weren't asleep. I thought maybe I could get to sleep while they were away, but I didn't. The mosquitoes were really crucifying me.

The boys came back about 2 o'clock and took off their shoes and lay down. With my blanket over the three of us we were as warm as toast. Along about 4:30 I guess we did sleep a little from sheer exhaustion. That gave the mosquitoes a clear field. When we woke up at dawn and crawled stiffly out into the daylight my right eye was swollen shut, as usual.

All of which isn't a very warlike night to describe, but I tell it just so you'll know there are lots of things beside bullets that make war hell.

Native carriers pause to allow a wounded soldier to get a light. New Guinea. 1942. Signal Corps photograph.

Tented Hospital Adaptations

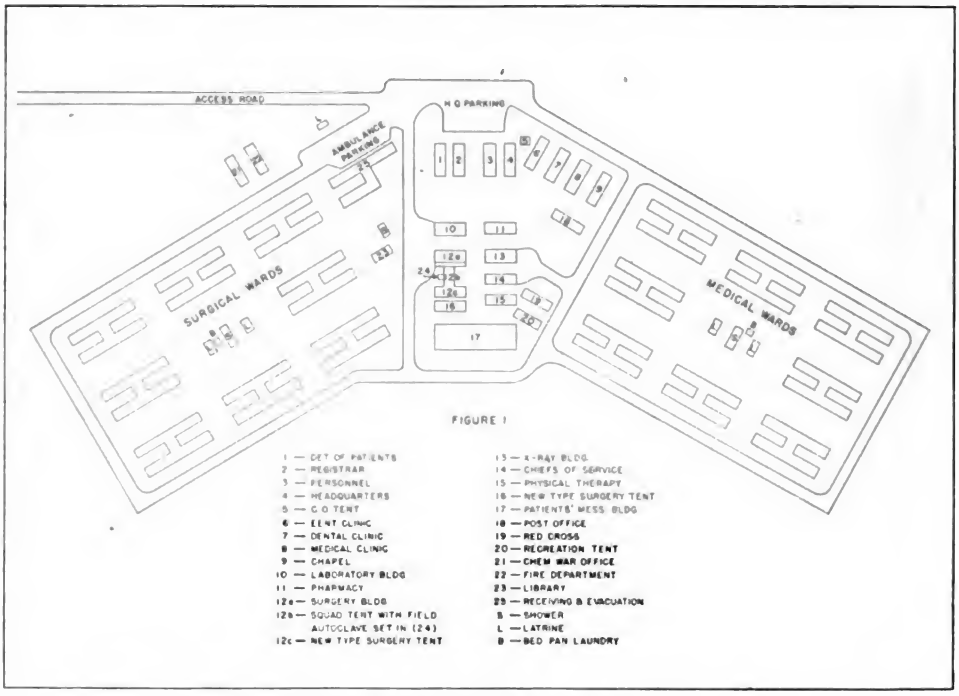
COLONEL T. L. BRYANT
Medical Corps, Army of the United States

Some variations in the use of tentage, normal supply items, and salvaged materials were found useful by a general hospital operating temporarily under field conditions in the Pacific Ocean Area.

THE USE OF TENTAGE

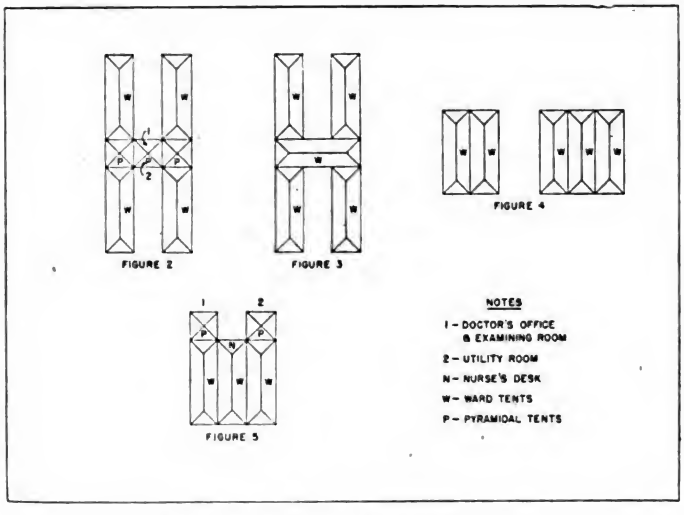
The wards for the medical and surgical services were set up according to the general plan shown in figure 1. These wards were located on either side of the central section which comprised the administrative and service portions of the unit. As shown in the diagram, each ward is an "H" type of arrangement, and each one is grouped about a central shower and latrine facility.

The wards were arranged in sections of two in an "H" formation, with four standard ward tents forming the parallel sides and three pyramidal tents forming the cross member (figure 2). The cross member is erected first and then the side members are



General plan of hospital.

added to it. A variation used was to substitute a standard ward tent for the three pyramidal tents in making the cross member (figure 3). Other possible variations of this arrangement are shown in figures 4 and 5.



Arrangements of ward tents.

By using the "H" type ward, the examining rooms, nurses' station, utilities, and mess serving facilities are maintained in the cross portion, with the ward tents reserved for bed space. This aids in the segregation of the various activities, does not encroach on the ward proper, and centralizes the personnel and supplies for better care of the patients.

The side walls of the tents, where they were joined together, were raised by wooden frames to allow for passage without having to stoop. The photographs (figures 6, 7, 8) show exterior and interior views of a typical ward.

FIGURE 6. Exterior view showing "H" arrangement of tents.

FIGURE 7. Interior view of cross member of "H." ward tent.

FIGURE 8. Interior of a ward tent.

BEDPAN LAUNDRY

To care for the bedpans and urinals for bed patients, the arrangement shown in figure 11 was designed. A section of the latrine was partitioned off by burlap cloth so that it could be used for dumping the contents of bedpans or urinals into the pit for disposal. A water line at this point permitted flushing of the vessels.

Adjacent to the latrine, there was constructed a 9-by-12-foot building which housed the bedpan laundry proper. This consisted of a 55-gallon oil drum divided longitudinally and used as a basin for washing the vessels in soapy water. Next to this were

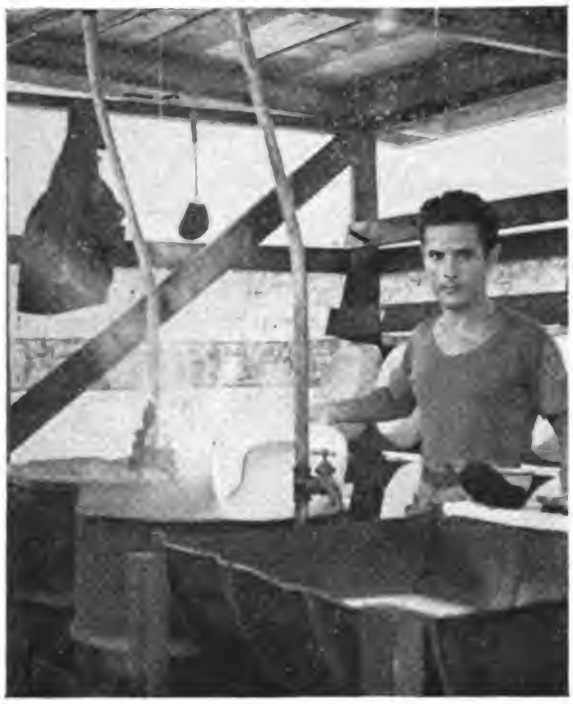


FIGURE 9. Interior of bedpan laundry.

two 55-gallon oil drums which had been cut down to two-thirds their original height and set on standard field gasoline ranges. The first of these was filled with an antiseptic solution (cresol solution) which was kept hot, but not boiling. The second contained clear boiling water, in which the pans were boiled for twenty minutes. Racks were constructed on the wall of the building for the drying and storage of the cleaned bedpans and urinals. A view of the laundry in operation is shown in figure 9.

FIELD DISINFECTOR A SOURCE OF STEAM SUPPLY

Because of the lack of a central steam supply in the temporary hospital, the Disinfector, trailer type (Med. Dept. Item No. 7791000), was used to great advantage. This unit furnished a source of steam for two batteries of instrument and water sterilizers (Med. Dept. Items No. 7910240 and 7910427) and also served as an autoclave to handle all sterilization for peak loads of more than one thousand casualties. This unit operated twenty-four hours a day with a minimum of mechanical difficulties. The necessary connections and general setup used in the installation are

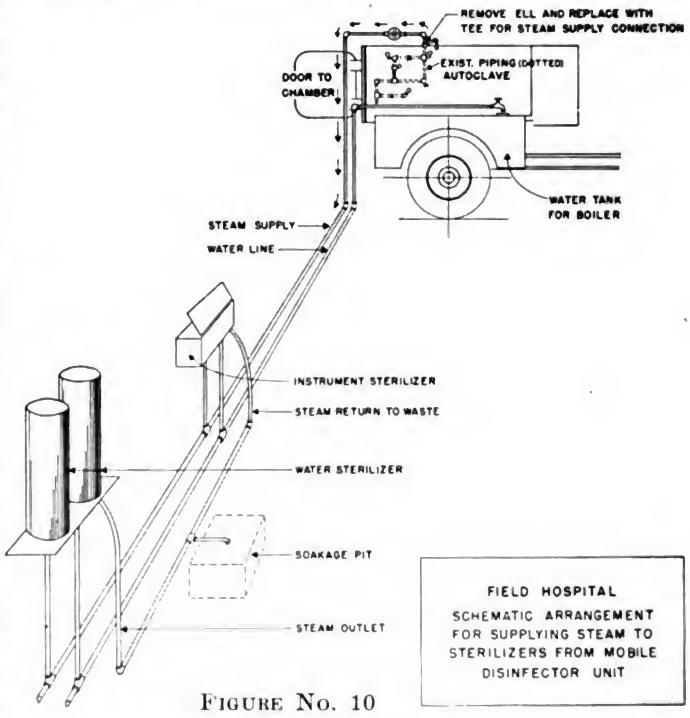


FIGURE No. 10

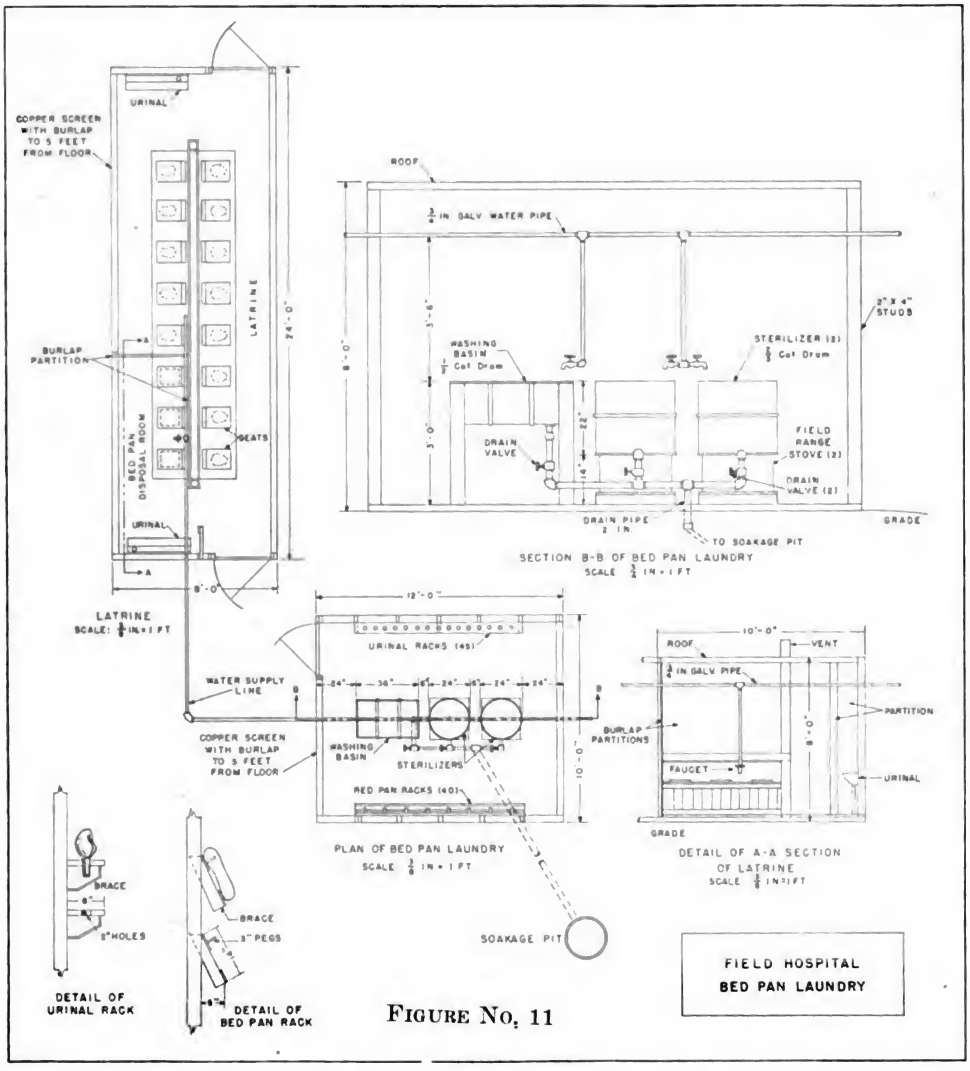


FIGURE No. 11

shown in figure 10. The method of placing the disinfector into the side wall of the tent to be used as an autoclave in the surgical supply room is shown in figure 12.

SIMPLE DEODORIZER

The trough-type urinal unless constantly flushed with water becomes objectionable and odorous in a short time. As paradichlorbenzene

FIGURE 12. View of disinfector in side wall of tent for use as an autoclave.

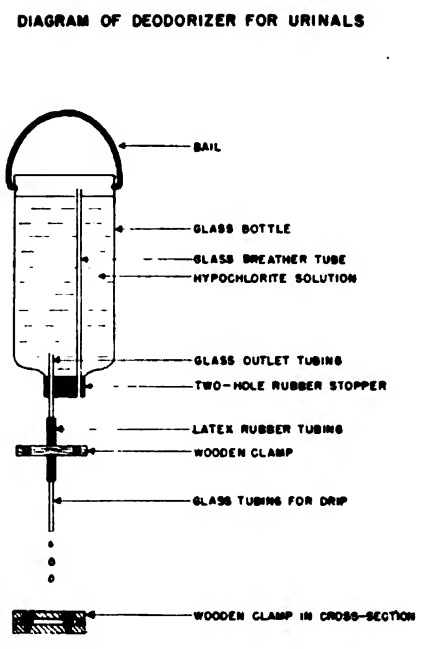


FIGURE 13

was not available, a substitute was necessary. Washing down once daily with hypochlorite solution cuts down the odor only temporarily. To improve this situation, the following method was devised. A discarded saline solution bottle with two-hole rubber stopper was fitted with glass and rubber tubing and an adjustable clamp made from two small blocks of wood and two screws. The bottle was filled with 0.3 percent calcium hypochlorite solution, inverted, and suspended over the end of the urinal farthest from the drain. The clamp was adjusted so the solution dropped at the rate of six to ten drops per minute, at which rate one liter of solution would last about twenty-four hours and would keep the urinal odorless. Figure 13 is a diagram of this device.

Review of 1,000 Thoracic Cases

In a report from a thoracic surgery center in the Mediterranean Theater of Operations, Major Thomas H. Burford presents the experiences with 1,000 thoracic cases. The following extract presents the types of cases observed and the therapeutic methods used in the management of these patients:

The most frequent therapeutic procedures employed were thoracentesis, blood transfusion, and secondary closure of wounds. The liberal administration of whole blood has been a salient feature of the center program. The prompt closure of previous properly débrided chest wall wounds has resulted in few wound breakdowns and has enabled us to clear beds at a rate otherwise unattainable. It likewise enables the reparative procedures to be undertaken on a solidly healed chest wall which we feel is one of the best possible protections against wound infection with subjacent pleural contamination. This practice also increases the number of reparative procedures that can be completed within the time of convalescence from the original injury.

This experience has demonstrated the fact that chest wall wounds when poorly débrided are a source of danger to the pleura. One cannot too strongly condemn the practice of failing to débride a wound simply because it is small or has been made by a high velocity missile. We have repeatedly re-débrided these wounds under penicillin protection and invariably found a subcutaneous area of tissue destruction out of all proportion to the entry wound and demonstrated direct extension of the infection to the pleural space.

Hemothorax is the largest single problem in the management of chest wounds in the base. Of the 870 intrathoracic wounds in this series, 86.4 percent had blood in the pleural space. Of these, 9.8 percent were clotted. Of the clotted group, 40 percent developed empyema. Of the 44 clotted hemothoraces that did not develop empyema, 7 were of sufficient extent to warrant decortication. An additional 10 were decorticated at the time of foreign body removal. The remaining 27 were allowed to clear spontaneously. It is our belief that where less than 50 percent of the pleural space is involved by x-ray, the noninfected case will clear in the majority of cases within six weeks. If at the end of this time satisfactory progress toward absorption and resolution has not occurred, then decortication is done.

The most gratifying result of the entire statistical study of this group was the low empyema rate. An empyema incidence of 11.2 is better than the most optimistic had dared hope for. The reduction of empyema as a complication of thoracic trauma to this favorable figure is the result of a total integrated program of management of chest wounds and reflects credit on all echelons, particularly the forward. It is apparent from a study of records that there is far more alertness to the proper débridement of chest wounds, the early, complete aspiration of hemothorax, and less tendency to perform an ill-considered thoracotomy. The use of penicillin in the forward areas both systemically and locally has no doubt further favorably influenced the empyema statistics. In the base, the proper management of the large clotted hemothorax has further tended to reduce significantly the number of empyemas.

The prophylaxis of chronic empyema is one of the most important functions of a center. Early pulmonary decortication has been of great value in this regard. Of the 111 cases of empyema in this series, 32 were subjected to decortication; 22 of these 32 were decorticated without preliminary drainage. A primary cure has been obtained in slightly more than 75 percent of those decorticated for massive empyema, impending chronic empyema, and early chronic empyema. The fact that in the entire group of 870 intrathoracic wounds only 4 cases are felt likely to require additional surgery indicates the effectiveness of measures utilized to deal with intrathoracic sepsis. It is felt that penicillin has been an invaluable adjunct in the management of these cases.

Lacerations of the heart and/or pericardium occurred in 24 cases. Only one case developed a suppurative pericarditis. Only one foreign body in the myocardium gave rise to symptoms. It was removed with complete relief. One intravascular metallic foreign body was observed. In this case the missile, a high explosive fragment, came to lie within the right main pulmonary artery. The position was verified by thoracotomy but removal was not carried out. The patient, now in the zone of the interior, writes that his only symptom is mild dyspnea on moderate exertion.

Lacerations of the esophagus were encountered in but 4 instances. It is noteworthy that the esophageal injury went unrecognized in two of the cases during the initial phase of treatment and is felt justifiable to lay a large share of the failure to recover in these two instances to this lack of prompt recognition.

Recurrent bronchopleural fistulae without serious parenchymal pathology have been observed in 20 cases. In fistulae of this type, infection is not a significant danger even though the fistula persisted or recurred over a period of eight to ten weeks. We have elected to treat these fistulae by the trocar insertion of a number 12 or 14 catheter in the 2d interspace in the mid-clavicular line. The catheter is connected to a "water-seal" bottle. It is left until air has ceased to escape and physical signs of complete pul-

monary re-expansion are present. This is usually a matter of forty-eight hours. In some cases a reinsertion will be necessary. This regimen has resulted in closure of the fistula and total re-expansion in all but one case. Closure of the fistula was effected in this case by open thoracotomy. Catheter insertion would seem to be a simpler, more efficacious therapeutic procedure than repeated needle aspirations.

The forward surgeons have become increasingly alert to the problem of the "wet-lung" of trauma and have been prompt in dealing with it. The fact that only one case of massive collapse has been seen at the center attests to the effectiveness of the prompt recognition and management of "wet-lung." Our experience with tension or pressure pneumothorax is consistent with the experience reported by others. No case has arrived at the center with a true tension pneumothorax. It is significant to point out that no instance of spreading undermining anaerobic infection of the chest wall was encountered in the entire series.

Lacerations of the liver and thoracoabdominals form another interesting group which we are subjecting to a more detailed statistical study. Of the 98 liver lacerations surviving to reach the base, 25 percent were complicated by either subphrenic abscess (14), bile empyema (5), or intrahepatic abscess (6). In the main there is a marked improvement in the forward management of these injuries and the instances where subcostal drainage has not been provided are creditably few. If any suggestion is pertinent, it would seem to be to stress the utilization of larger and more laterally placed drainage wounds and to re-emphasize the caution not to remove the drains too soon. Repairs of the diaphragm have held. No case of posttraumatic diaphragmatic hernia or eventration has been seen in the battle casualty group that has been subjected to a suture of the diaphragm.

Nothing would appear to be gained in this report by a reopening of the old controversy concerning the "forward" thoracotomy. Experience has satisfactorily arbitrated most of the differences of opinion that existed, and the consulting surgeon has by discussions and directives effectually equilibrated the issue. Suffice it to say, with the clarification of indications for thoracotomy, significantly better results have been obtained and fewer thoracotomies performed.

The problem of the intrathoracic foreign body is interesting and information is beginning to accrue that will do much to clarify their management. The policy of removing those of 1.5 cm. in diameter and over, after a sufficient recovery period from the initial injury has proven increasingly sound. Studies now in progress indicate that about 25 percent of cases with intrathoracic foreign bodies develop significant complications during the first three months. In a series of 68 thoracotomies done for foreign body removal there have been no deaths and no disabling complications. Whenever possible, thoracotomy for the removal of the foreign body is done at a time early enough to permit the convalescence from the operation to fall within the convalescent period from the original wound or wounds.

Study of Psychiatric Problems.—Representatives of the Neuropsychiatry Consultants Division, S. G. O., recently accompanied officers from The Inspector General's Office and from the Office of the Assistant Chief of Staff, G-1, to two combat theaters to study psychiatric problems in the Army. Of special interest in this study were the incidence of psychiatric disorders, channels of disposition of noneffective personnel, and the function of the line in matters related to motivation and morale.

Laboratory Diagnosis of Infection with Schistosoma Japonicum

A number of our troops have acquired infection with *Schistosoma japonicum* in the Philippines. It is important, therefore, that laboratory personnel become familiar with procedures which may be used to detect infection or confirm the clinical diagnosis of schistosomiasis.

In the early stages of infection with *Schistosoma japonicum*, the blood frequenly shows a striking and rapidly increasing white cell count, with marked eosinophilia. As the disease progresses, these abnormal findings tend to disappear. Eosinophilia is an important diagnostic sign and, when noted, the presence or absence of other intestinal parasites should be determined. Except in the late stages, anemia is not necessarily present. Although examination of the blood may provide indicative or supportive evidence of schistosome infection, the demonstration of eggs or miracidia of the parasite is relied on principally to establish or confirm a diagnosis of schistosomiasis.

In established infections, eggs discharged in the feces are usually mature and contain fully developed ciliated miracidia. The eggs are 70 to 100 microns long by 55 to 65 microns wide and have well-rounded ends. They may have a light yellowish-brown color or be hyaline. When the egg is properly oriented, a minute spinous process resembling a recurved hook extending from a depression on one side of the egg near the end is sometimes visible. In a viable mature egg, the miracidium may be seen squirming within the shell and moving its cilia in rhythmic fashion. Detail is obscured and the appearance altered in some specimens by adherent tissue remnants and fecal debris. Occasionally, stools may contain eggs in which miracidia have disintegrated. It has been reported that many of the eggs first passed after infection may be immature. These may be overlooked, since the characteristic morphologic details apparent in those with mature miracidia are lacking and these eggs may fail to hatch, with a resultant

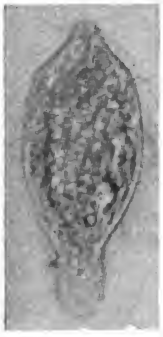
Immature egg of *S. japonicum* (340X).

Mature egg of *S. japonicum* from feces (340X).

From the Tropical Disease Control Division, Surgeon General's Office.
The illustrations are reprinted from "Studies on Schistosomiasis Japonica" by Ernest Carroll Faust, Ph.D., and Henry Edmund Meleney, M.D.; Amer. J. of Hygiene, Monographic Series, March 1924.

negative examination when the egg-hatching technique is employed.

The miracidium of *S. japonicum* is, after hatching, a very active, free-swimming organism which propels itself by means of cilia covering its surface. When observed in the surface film, it shows a fishlike movement. A small, primitive gut is present at the cone-shaped anterior end, and on each side of this structure is a lytic gland. Slightly posterior to these is a second pair of glands which open laterally. Two flame cells, conspicuous because of the rhythmic movement of their cilia, are present on each side of the body. Proliferating germ balls are located in the posterior end of the larva. Use of the high-power, or oil-immersion, lens is required to distinguish some of the detailed structure of the miracidium.



Escaped *S. japonicum* miracidium, free in water. (300X)

Several techniques may be used to detect *S. japonicum* eggs in stool specimens. Since the eggs and miracidia are difficult to demonstrate in early and in very late cases, as well as in light infections, a diagnosis of schistosomiasis should not be excluded by a single negative stool examination. The use of more than one technique is advisable when negative results are obtained in suspected cases of the infection. The fact that immature eggs which fail to hatch are passed during the early stage of infection should be borne in mind. Concentration of eggs by zinc sulfate flotation is not very satisfactory. Some of the suitable techniques are described below.

Examination of a direct smear. A simple smear of feces mixed with a drop of physiologic saline solution on a slide reveals many positive specimens in heavy and well-established infections. Smears should be made from any blood or mucus present in the stool specimen and preferably from the surface of the stool. When negative results are obtained, this technique should be supplemented by other procedures.

Sedimentation. A portion of the stool specimen is comminuted in five to ten parts of tap water, poured into a conical urinalysis glass, and allowed to sediment for thirty to forty-five minutes. The supernatant fluid is decanted and the sediment resuspended by the addition of water. The process is repeated three or four times until the lighter debris has been removed and the supernatant fluid is relatively clear. After the final washing, the sediment is transferred to a slide by means of a pipette and examined for the eggs, using the low power of the microscope. Several smears should be examined before a negative report is made. Sedimentation and examination should be completed within six hours after dilution of the feces, otherwise hatching may occur. If eggs are not demonstrable by the sedimentation technique, an egg-hatching technique should be employed.

Egg-hatching technique. The sedimentation technique is carried out on a generous portion of the stool specimen as described above. The final sediment is transferred to a graduate cylinder or preferably a large Erlenmeyer flask and the container filled with water free from chlorine. It is allowed to stand, preferably at a temperature of 30° C., for six to twelve hours or overnight, to permit the eggs to hatch. The free-swimming miracidia collect near the surface of the water. The small area at the top of the flask concentrates the organisms so that they are more easily detected. The miracidia may be observed in proper light by use of a hand lens. They appear as minute, white, boat-shaped bodies swimming rapidly in a straight course. The miracidia must not be confused with free-living ciliates which sometimes contaminate water. To confirm the identification, a few of the organisms should be transferred to a glass slide and examined under higher magnification. A dilute aqueous iodine stain may be added to facilitate identification.

Acid-ether technique has been shown to be extremely efficient and practicable for demonstrating *S. mansoni* eggs. Preliminary studies indicate that it may be useful for detecting eggs of *S. japonicum.* About 1 gm. of fecal material (about the size of a pea) is thoroughly emulsified in 5 cc. of 40 percent HCl (40 cc. concentrated HCl diluted to 100 cc.) in a small vial. The material is filtered through two layers of moist gauze stretched over the top of a 50 mm. funnel into a 15 cc. centrifuge tube. An equal quantity of ether is added and the tube is stoppered with a gloved finger and shaken thoroughly. It is then centrifuged for one minute at 1,500 r.p.m. On removal from the centrifuge, the debris floating at the acid-ether junction is loosened by ringing with a clean applicator and the acid and ether layers are rapidly poured off and discarded. The same applicator is then used to stir the sediment in the few drops of fluid remaining; the sediment is then transferred to a slide and examined under a cover slip.

Controlled serologic and skin tests may be helpful as adjunct diagnostic procedures in cases in which *S. japonicum* eggs are not demonstrable. A positive skin reaction appearing within fifteen minutes is obtained in a high percentage of cases following intradermal injection of group-specific antigens prepared from saline extracts of adult schistosomes, cercariae, or infected snail tissues. The use of these techniques is limited by the difficulty in obtaining material for preparation of the antigens.

Fats and Bones Salvaged.—Twenty million pounds of cooking fats were recovered in Army messes in the United States during 1944, effecting a cash saving of about $3,200,000. According to reports from the Quartermaster Corps, these fats were re-used in Army kitchens until spent, after which they were sold for more than $1,000,000 to renderers and soap manufacturers. Army messes also salvaged more than 8,000,000 pounds of trap grease, which was sold for $182,000, and 55,000,000 pounds of bones and raw meat trimmings, which brought $940,000 at salvage sale.

Improvements in Treatment of Venereal Disease

Despite the generally upward trend in the uncorrected venereal disease admission rate among troops in continental United States since the middle of 1943, the noneffective rate for this cause has been gradually diminishing. Scientific discoveries in chemotherapy, together with outstanding work in their application, can be credited with the spectacular reduction in days lost by patients with these diseases, and with a great reduction in complications from gonorrhea. The new methods of treatment have the additional advantage of being virtually free of toxic reaction. The average length of hospitalization for a patient with venereal disease in 1939 was 42 days. By 1944 this figure had declined to 6.5. Even in the face of a rising admission rate, a saving in manpower has been accomplished, as shown in figure 2. The bottom line shows the *actual* noneffective rates for venereal disease since June 1942, the earliest date for which rates by month are readily available. The top line demonstrates *what the same curve would have been,* on the basis of the observed admission rates, if the average of 15 days lost per case in June 1942 had continued to date.

VENEREAL DISEASE ADMISSIONS PER THOUSAND MEN PER YEAR AND DAYS LOST PER CASE, CONTINENTAL UNITED STATES

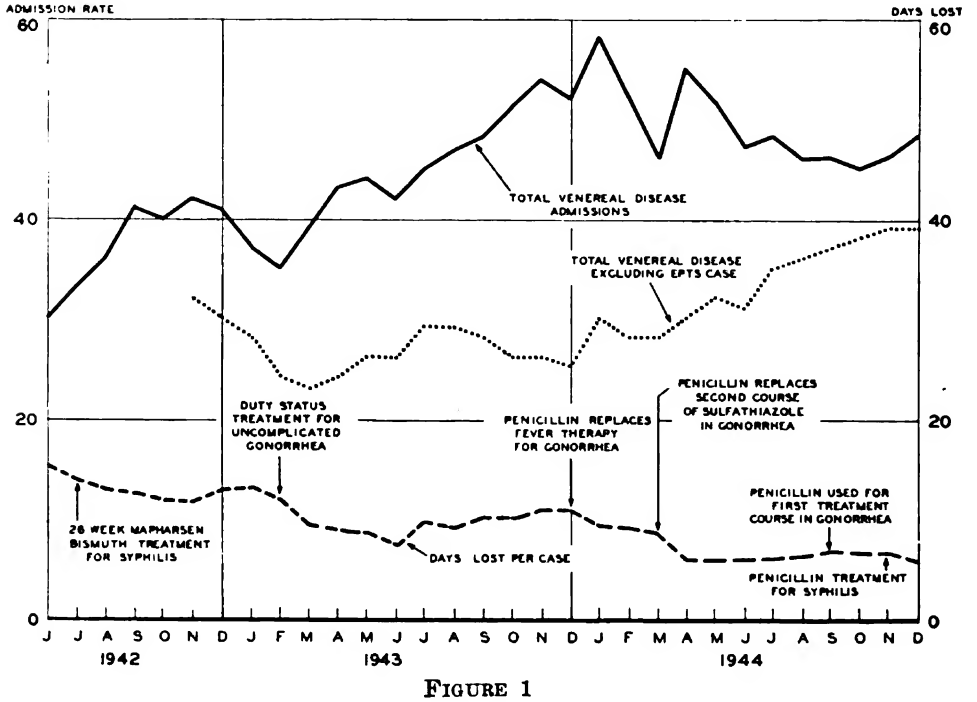


FIGURE 1

Prior to the sulfonamide era, treatment of gonococcal infections consisted mainly of local therapy—instillations, irrigations, massage, and instrumentation. Disabling complications were frequent; in 1937 they occurred in 28 percent of all cases in the Army. The introduction of sulfonamides revolutionized medical thought with regard to management of gonorrheal infection. Coincident with the introduction of systemic chemotherapy and the gradual abandonment of local therapy, a tremendous decrease has occurred in the duration of infection and in the number of complications. Sulfanilamide, the first sulfonamide employed, was soon superseded by sulfapyridine, and later by the more effective and less toxic sulfathiazole. Treatment was routinized as far as possible, the recommended course being one gram of sulfathiazole four times a day for five days.

Second courses of therapy were recommended in cases in which evidence of persistence or recurrence of the disease existed. Sulfonamide-resistant cases were transferred to general hospitals and received fever therapy. It is estimated that this group, constituting from 10 to 20 percent of all cases, contributed fully 50 percent of the total days lost. The rise in the curve of days lost during the last half of 1943, as shown in the chart, is the result of the necessity for using fever therapy for an accumulated backlog of sulfonamide-resistant cases. More than three-fourths of all patients with uncomplicated gonorrhea responded to one or two courses of a sulfonamide drug, the incidence of complications was low, and toxic reactions from sulfathiazole were exceedingly uncommon. Furthermore, when patients were treated on an ambulatory basis, the end results in terms of cure, complications, and drug reactions were nearly as favorable as when treatment was given in a hospital. Treatment of gonorrhea on a duty status, authorized for the Army as a whole in February

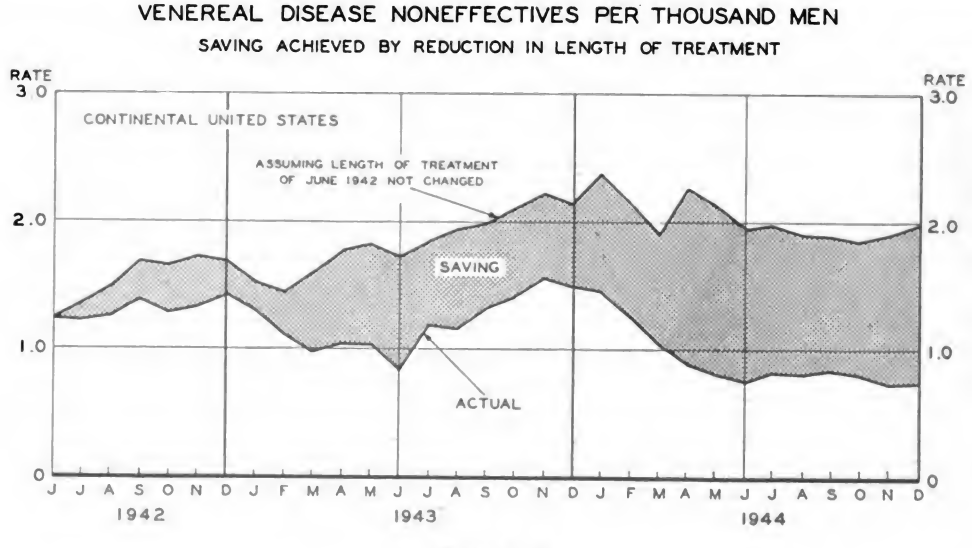


FIGURE 2

1943, effected an additional saving in days lost. In early 1943, the effectiveness of penicillin in sulfonamide-resistant gonorrhea was recognized and, when the limited supply allowed, the drug replaced fever therapy in such cases. Penicillin was also made available to certain troops overseas. By March 1944, penicillin had been substituted for sulfathiazole in all cases requiring a second course, but not until September 1944 did the supply situation permit penicillin to be declared the drug of choice throughout the Army and the use of sulfonamides to be limited to cases not responding to adequate penicillin therapy. Preliminary data indicate that one course of penicillin with a dosage of 100,000 units may be expected to effect cures in more than 95 percent of cases. Complications of gonorrhea respond to penicillin well although the more serious forms may require prolonged treatment with higher dosage. Drug reactions have been minor and infrequent. Penicillin therapy may soon reduce gonorrhea to the status of an inconsequential infection.

Although the *length of hospitalization* for syphilis has been reduced only very slightly by the progress in therapeutic methods, substantial savings have been achieved in *length of treatment*. Military requirements are best served by a system of treatment covering the shortest possible time consistent with safety to the patient and therapeutic efficiency. Although symptoms caused by early syphilis can be quickly eliminated, treatment itself has often resulted in morbidity, while continuation of treatment over long periods has presented numerous administrative difficulties. In July 1942, on the basis of experience with arsenoxide (mapharsen) and to meet the exigencies of the patient and the Army situation, the Army adopted, in lieu of the 52-week program of neoarsphenamine-bismuth, a 26-week plan of mapharsen-bismuth therapy, thus compressing to a period of

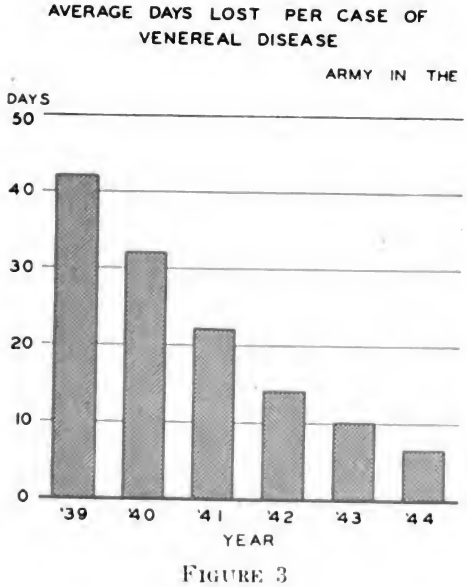


FIGURE 3

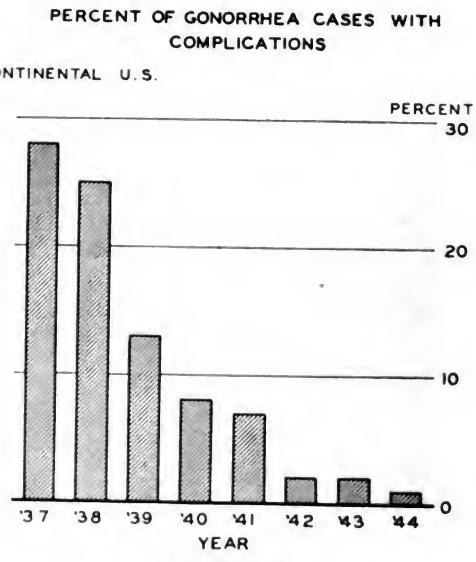


FIGURE 4

six months the formerly routine 12-month or more procedure. From the standpoint of toxic reactions and practicability of administration, the newer scheme appeared definitely superior to the old. Since the total amount of arsenical administered was practically the same, it is believed that the end results do not differ significantly under the two schemes of treatment and that cures are effected in not less than 85 percent of early cases. Persons with primary or secondary syphilis are hospitalized for a week or ten days until rendered noninfectious, after which treatment is carried on by unit medical officers.

Intensive methods of arsenotherapy, such as the five-day intravenous drip, appear to offer many advantages to the armed services in terms of length of treatment. The evidence indicates that results achieved by these methods in early syphilis are equal to those of the more time-consuming techniques; but the enhanced risk of serious reaction or death has not justified adoption by the Army of any intensive method using arsenical drugs yet developed. In all large series reported, death has occurred in one of about 250 patients treated, as compared with a mortality rate from treatment alone of about one in 5,000 when arsenoxide is given by routine methods.

On the basis of experiments demonstrating the effectiveness of penicillin in the treatment of human syphilis, War Department Technical Bulletin TB MED 106, "Penicillin Treatment of Syphilis," 11 October 1944, introduced the penicillin treatment of syphilis on an Army-wide basis in October 1944, although this method of treatment had been authorized for overseas troops at an earlier date. With a total dosage of 2,400,000 units given in sixty consecutive intramuscular injections at three-hour intervals day and night, the *total treatment time* is thus reduced to seven and one-half days. This method is at least as effective as any treatment plan heretofore employed, and much less dangerous.

Huskies flown from Iceland were used during heavy snows on the Western front last winter to transport wounded American soldiers. This unit, a part of the Arctic Search and Rescue Unit, North Atlantic Wing, is resting here in France. Signal Corps photograph.

The Infantry Battalion Medical Section in Combat

This is an attempt to record a few impressions concerning an infantry battalion medical section in combat against the Japanese. Because of specialized professional interests, the majority of medical officers may consider the infantry battalion medical section only a necessary evil. The medical officer assigned to an infantry battalion is likely to feel he is no more than a glorified aid man and, at times, possibly, to resent his assignment. Viewed from a wider aspect, the infantry battalion surgeon becomes most important and an efficient battalion medical section becomes a necessity in combat. The Medical Field Manual (FM 8-10) states that the battalion medical service is the foundation stone on which rests the whole medical organization for the care of battle casualties. As time goes on, the psychological conditioning of the rifleman to combat assumes ever-increasing importance and recognition. Nothing destroys more quickly the rifleman's will to fight than a medical section that is inefficient and ineffective in the removal and care of the wounded. While it is true that the disposition and care of wounded after removal from the battalion area have little immediate effect on the morale and efficiency of the foot troops still engaged in combat, the care and handling of casualties on the front line are observed and are quite tangible to the infantryman. A breakdown and failure of medical service within the battalion, therefore, has a tremendous effect on the fighting ability of the troops, probably more so than is generally realized. There seems to be a tendency to find the least experienced medical officers assigned to a battalion and to allow the infantry medical section to grope along as best it may. Military medical journals rarely deal fully with infantry battalion medical problems. The following suggestions, perhaps differing slightly from established doctrine as taught, are *meant to apply to only some of the situations met in island jungle warfare against the enemy, Japan.*

ORGANIZATION OF THE SECTION

A tendency on the part of medical soldiers and officers is to consider themselves entirely separate from the infantry battalion they serve. This has been noted time and again, even in instruction received in a combat zone. Some degree of separate administration is perfectly satisfactory, but in tactical situations it must be realized that the medical section is entirely subservient and

This paper by a medical officer who had combat experience with infantry battalions representing at least four divisions includes his own impressions based on that combat experience.

functions as an integral part of the infantry under the command of the battalion commander. In short, in combat, medical personnel must be more infantrymen than medical soldiers. If the medical section is truly efficient, the battalion commander will welcome the relegation of all medical decisions to the surgeon. Too often there is unnecessary friction engendered by refusal on the part of the medical section to relinquish false ideas of an autonomous position. To be really effective, a medical soldier, as any soldier, must have a strong feeling of regimental and battalion *esprit de corps* formed by constant association and familiarity with the infantry soldiers with whom he works. A good aid man must consider himself an integral part of the rifle company to which he is attached.

Flexibility should be the keynote of organization of an infantry medical detachment. This is stressed in FM 7-30 and 8-10 and is more than ever important in the jungle. During a battalion's first heavy combat, it is immediately noted that the medical soldiers are too few and far between. The present T/O for the battalion medical section is satisfactory, provided replacement and reinforcement are quickly available. The demand for medical soldiers varies greatly and depends entirely on the combat situation. Where movement and contact with the enemy exist, slight changes from the usual plan may be advisable. A good plan for the distribution of the thirty-two enlisted men of the battalion section follows:

1. Four company aid men with each rifle company committed to action; one to each rifle platoon and the fourth and senior aid man operates with company headquarters. The additional aid man at the company command post helps the litter bearers locate casualties. In jungle-type warfare this is one of the greatest difficulties.

2. In platoon or smaller patrols two men are assigned—one company aid man and one aid man from the aid station group.

3. In some battalions the aid man in a platoon unofficially selects a rifleman as a part-time assistant who has at least the rudiments of first-aid instruction, particularly as to the contents and use of the aid man's first-aid kit.

4. The staff sergeant section leader should be given the responsibility of liaison with the companies and management of the litter squads. He should also assist the Medical Administrative Corps officer in supervision of evacuation from the aid station to the rear. At times a dependable enlisted man is assigned to the battalion command post as a runner.

5. A well-trained clerk for the battalion medical section is indispensable and should have at least one understudy. The same holds true for the battalion medical supply sergeant.

6. Each litter squad should be composed of four or more men and have a leader designated who acts as the "point" in movement of the squad. Additional litter bearers should be quickly available from the rear; hence, the advantage of an enlarged regimental pool. Otherwise, battalion headquarters company infantry personnel must be drafted into service frequently.

7. Litter squads do not follow along behind riflemen as advocated but instead remain with the aid station group and go out to gather casualties on call. With so few litter squads available, this is absolutely the only workable plan. Until his new men gain confidence in themselves, the battalion surgeon may have to go out with litter squads for casualties himself, though this should be avoided as much as possible.

In other situations, as for example a stationary beachhead perimeter defense, a different distribution of personnel may be desirable. If the perimeter defended is extensive, it may be necessary to establish additional battalion aid stations, perhaps as many as three or four, which may be occupied quickly in the event of hostile attack at any particular sector of the long front. Reliance on a single station may result in its being separated by one-half mile of jungle trail from active sector and casualties. It may be necessary to divide the aid station group in order to operate more than one aid station along the front. Additional personnel from the rear would be valuable in such situations, particularly medical officers. Failure in the establishment of secondary aid stations ready to be occupied at a moment's notice along an extended front has accounted for much inadequacy of medical service.

EQUIPMENT AND SUPPLIES

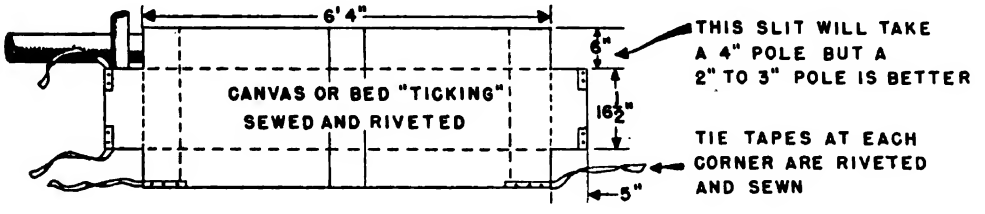
The amount of equipment carried by the battalion section will depend entirely on the type of operation undertaken. A good rule is to take as much as possible of the indispensable items. Dependence on good supply from the rear is often disastrous, as availability of motor transport, terrain, distance of march must all be considered. On all occasions complete arrangements for hand-carry must be maintained. Motor transport often fails at most unexpected times.

The ¼-ton litter truck is very valuable, and each regimental medical detachment should have at least one equipped with trailer assigned to each battalion section. A litter, ¼-ton, truck is the ordinary vehicle to which has been attached a "homemade" strap iron rack for three litters.

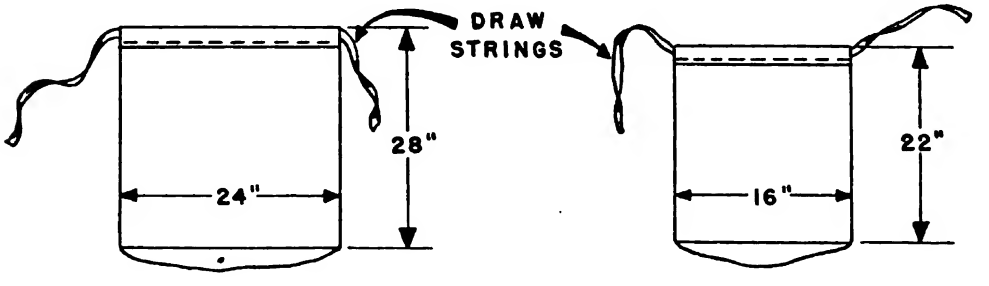
As hand-carry of equipment is more often than not the case in jungle combat, certain changes in the usual equipment have proved useful. M.D. Chests Nos. 1 and 2 and most of the other unit equipment are far too difficult to transport or handle in a small boat and contain many items that are of little use in combat. Where a battalion may be isolated for several days or a week separated from supply, the hand-carried equipment assumes considerable importance. On such occasions additional medical personnel should be assigned to the battalion—if only to help carry equipment. Some items found useful are as follows:

1. *Litter* of the conventional type, the light-weight metal litter which folds in the middle as well as lengthwise, listed as Litter, folding, aluminum, is most adequate. The heavy straight metal or wood litter or Litter, metal, Stokes, is not adapted to jungle terrain and should be reserved for hospitals or ships. A battalion section can manage to carry six or eight such light-weight litters long distances.

A most useful item in the jungle is the Marine raider or paratroop litter which consists only of the fabric portion without frame. The hand poles and two cross poles must be cut from small trees in the vicinity. A battalion section should have six to twelve on hand. Following is a diagram of this type of litter:



2. *Supply bags.* The most satisfactory way yet found to carry bulk supply is by waterproof fabric bags made with drawstrings like a barracks bag. The material is rubberized poncho cloth. The two sizes illustrated have been found most useful—two large and four small:



Infantry mortar shell carriers may be used to supplement the rubberized bags but are not waterproof and are just as difficult to carry.

3. *Plasma.* As much plasma as can be carried is the rule. Plasma units are bulky but it is No. 1 priority. Each man in the aid station group carries one extra unit made up in his combat pack. The main supply of plasma is carried in mortar carriers and waterproof bags. One section has given as much as or more than 200 units in a three-week period of combat. It would be a great aid to have the newer normal serum albumin (human) concentrated available for issue to jungle troops in order to cut down on bulkiness.

4. *Splints.* The splint, Army, leg, half-ring, is much more frequently used than the splint, Thomas, arm. Both are valuable and well worth the trouble of hand-carry. The wire ladder and basswood splints are easy to carry and always should be included. The regular splint set (Med. Dept. Item No. 9781500) is broken down when in combat and carried in divided loads. Makeshift splints are usually most unsatisfactory.

5. *Indispensable items.* Plasma; morphine Syrettes; dressings, first-aid, small (Carlisle); sulfanilamide, crystalline; sulfa-

diazine tablets; bandage, gauze, roller, 3-inch; bandage, muslin, 5-inch; cotton, absorbent, compressed, 1 oz.; plaster, adhesive, surgical, 3-inch.

6. *Additional supplies always hand-carried by one battalion section.* Amytal, N.N.R., 1½-gr.; codeine sulfate ½-gr.; atabrine 1½-gr.; alcohol, ethyl; acid, salicylic (powder); collodion; small amount iodine or merthiolate tincture; sulfadiazine ointment, 5 percent (water soluble); sulfaguanidine, USP 7.7-gr. tablets; cupric sulfate (phosphorus burns); calcium hypochlorite (bulk); potassium permanganate, N.F., 5-gr. tablet; acid, boric (bulk powder); foot powder, extra, 2-oz. cans; sodium chloride, 10-gr. tablets (bottle container); metaphen ophthalmic ointment (butyn); caffeine and sodium benzoate—tablets and ampules; ephedrine sulfate, ¾-gr. ampules; ephedrine hydrochloride injection, 1-cc. ampule (1:1,000); metrazol, 1-cc. ampules; quinine dihydrochloride, 1-cc. ampules; pentothal sodium, 1-gm. ampules (with 20-cc. ampules sterile distilled water); procaine hydrochloride (2.5-cc. dental ampules); soap and scrub brush; towel, hand (in separate sterilized packets); gauze—made up into square flats in sterile packets; forceps, hemostatic, mosquito, 5-inch, straight, Halstead; forceps, hemostatic, 6¼-inch, curved, Rochester-Pean; forseps, hemostatic, 7¼-inch, straight, Rochester-Ochsner; knife, operating—Bard-Parker type with blades; razor; scissors, operating, 5½-inch, straight, 1 point sharp; ether; syringe, Luer, 30-cc.—15-gage needle; syringe, hypodermic with needles 25- and 20-gage; gloves, surgeon's—in separate sterile packets; gauze, petrolatum—sterilized, in square tin; suture, silk, noncapillary, sizes 00 and 2; specula, ear, set of 3; flashlight; catheter, urethral, rubber, 18Fr Nelaton (sterile packet); tube, trachea (Jackson) (plasma tube or catheter may substitute); pin, safety, large; chlorine test set (orthotolidine); kit, suction (snake bite); forceps, tissue, spring, 5½-inch (several); needles, surgeon's regular and intestinal (curved). Adequate sterilization of instruments while on the move in the jungle is often next to impossible. For that reason and to save time, it is a great aid to have each forcep, etc., packed in separate sterile wrapper. The hemostatic forcep is virtually the only operative instrument used to any extent.

This list is indeed long but in bulk and weight is small and can easily be hand-carried in two or three paratroop style medical carriers or in waterproof bags. Perhaps the conditions would have been adequately met by some of the standard *pack type medical* equipment which has not been available in this area. Actually, dispersion of medical supplies is desirable though an undue amount complicates matters. The company aid men carry only the simplest equipment, as in the standard kit. On occasion, a departure from the usual plan is made in that some company aid men, privates first class, are allowed to carry small amounts of morphine.

Other aid station equipment always carried consists of the following: axe, handled, chopping, single bit; machetes; extra rain ponchos (in place of blankets) ; stove, 1-burner, gasoline (C-ration, can-alcohol stove quieter and efficient). Cocoa units, blanket sets, etc., are of little use in the tropics and because of bulk and weight are not hand-carried.

7. *Noncombat equipment.* In rest areas and similar situations it has often been noted that the usefulness of the battalion surgeon could be increased were he issued: a sphygmomanometer, aneroid; otoscope and ophthalmoscope, combined, electric; and vision test set, complete. The aneroid type sphygmomanometer would be useful in combat as well.

TRAINING OF MEDICAL PERSONNEL

To date, the majority of medical officers new to the infantry in combat are sadly deficient in their conception of infantry duty in the jungle. Some are far too prone to regard themselves as unfortunate physicians unpleasantly assigned and far detached from any responsibility of command or tactical knowledge. A different attitude and training might save lives, including their own. It is essential that the infantry medical officer be taught something of infantry tactics such as patrolling and particularly the proper disposition and protection of his own men and patients. It is hoped that some aid may be gained from the following impressions learned in combat:

1. Litter teams lack training in loading casualties onto LCPs in heavy surf, a very difficult task that requires the utmost in speed and teamwork. The transport of litters on makeshift bridges and homemade rafts is also difficult.

2. Litter squads in combat action must be well-grounded in all details of scouting and patrolling. Most of them are not. Routine litter drill is of little value.

3. A rudimentary knowledge of such installations as a battalion communication system, operation of heavy vehicles and landing craft, and makeshift rafts and bridges may pay dividends in combat.

4. Familiarity with the capabilities and sound of enemy weapons likely to be encountered is most valuable. A common mistake is to confuse enemy grenades with mortars, mortars with cannon, and so forth. Ability to guess the more likely impact areas of enemy fire will prevent many casualties. This is often easy to learn. The impact area will usually be determined by the type of enemy weapon. For instance when the enemy fire consists of flat trajectory weapons such as machine gun and cannon, a slight defilade will offer fairly adequate cover which might not be the case were the enemy firing mortars. Thick tree cover will often provide excellent protection against "knee" mortar fire by causing tree bursts. In the open terrain an open foxhole may suffice as protection against bombing attack, for there ground bursts would be expected. In heavy forests, however, covering,

1½ feet thick, over dugouts will afford adequate protection from *tree* bomb bursts of even 500-pound bombs though the tree burst be directly overhead. Protection against tanks has not been stressed enough.

5. Disposition and placement of personnel, the establishment of covered routes of evacuation and lateral connecting trails, the construction of secondary and multiple aid stations, all in relation to a long perimeter defense situation, have not been well-understood or carried out.

6. *Aid station construction.* Well-covered small numerous dugouts are always preferable to large open holes when time for construction permits. When possible a "blackout" aid station should be dug in to allow for night operation. On familiar terrain there is no reason to refrain from night evacuation and care of casualties when with seasoned troops, even though the enemy may be in force only 50 or 100 yards from the aid station. Caution, of course, must be exercised and a word signal passed along to prevent unfortunate accidents. Contrary to some opinion in the jungle, plasma and dressings can be administered at night with the aid of several shelter halves and a shaded flashlight, plus a good foxhole, even though the enemy be almost in range of a hand grenade.

7. *Warning to medical personnel.* The Japanese infantryman has not the faintest respect for Geneva Conference regulations in regard to medical personnel or casualties. It has been often illustrated that the Japanese sniper will select the man carrying supply rather than the man carrying only a rifle even though the load happens to be a litter or even a litter containing a casualty. It has also been proved that the Japanese may kill any helpless casualty who falls into their hands or in range of their bayonets.

8. The weapons of battalion casualties must not be thrown away or scattered about as often happens. It is disconcerting, to say the least, to be on the receiving end of fire from our weapons that because of carelessness have fallen into the hands of an infiltrating enemy. Medical sections may have to take on themselves this additional responsibility of the rescue and disposal of casualty weapons. Our own weapons, particularly the Browning automatic rifle and grenades, are most unpleasant when in enemy hands, as many American soldiers can testify.

9. Experience in treating wounded Japanese prisoners at different times indicates that, while at the battalion front at least, no enemy casualty can be trusted. One prisoner though terribly wounded attempted to detonate concealed grenades with his feet. Once away from the front lines prisoners usually become most docile, cooperative, and even grateful.

CARE OF THE CASUALTY IN COMBAT

In regard to medical care of patients, speed of handling and rapid safe evacuation of wounded are always paramount. The medical officer has no time for indecision and fancy dressings.

Often he must use bold or even rough measures, far different from hospital practice. On the other hand, it is senseless to waste professional training by not examining each case carefully, no matter how trivial or how serious it may at first appear. Surgical judgment must always be exercised to the best of one's ability. It is also senseless to place speed of evacuation above all else. It is not good judgment to risk sending men over long trails with incompletely controlled hemorrhage, uncontrolled sucking or pressure wounds of the chest, wounds of the face or throat which partially obstruct respiration, or *in extremis* from untreated shock. The tendency too often is "anything to get the man away from the zone of immediate combat." Plasma may often be continued in a lifesaving manner all during evacuation; even up to six or eight units may be given without delaying the trip to the clearing station. Careful splinting is always desirable.

Most medical officers will find in practice that they will personally dress, splint, insert plasma needles, and care for most of the seriously wounded, using the aid men as assistants. He must delegate jobs to each. Even with well-trained and veteran aid men this system usually prevails and probably is as effective as any in the long run.

For the fatigued and psychically shocked soldier who is cooperative, a little attention, sedation, and rest in a deep dugout near the aid station will often bring him around in a day or so. When the situation dictates, it is the very rare anxiety case that cannot be made to walk out under stimulation of the proper encouragement. Time and again, litter squads or riflemen will fatigue themselves unnecessarily by litter-carrying "combat fatigue" cases. Attempt to place the neurosis casualty so that he will not be observed by the riflemen nearby.

The doctor can make his position as infantry battalion surgeon just what he wishes. He can make it entirely enjoyable or unbearable; it is up to him. His service also can be instructive and a valuable medical experience not found anywhere else. If the doctor wishes to be held in high esteem in his battalion, again it is up to him. A comradeship soon develops not duplicated elsewhere in the Army. More important in combat, sometimes the superficial facade we call civilized society is brushed aside and the physician is given glimpses of men as they really are. Most infantrymen are good!

Manual of Diagnostic Psychological Testing.—This publication of the Josiah Macy, Jr., Foundation has been distributed to all clinical psychologists and all psychiatrists in general hospitals and other medical installations. The first of three monographs on diagnostic testing, it is concerned with intelligence and concept formation. The manual discusses the use of the Bellevue scale, the Babcock test, the similarities test, the sorting test and the Hoffmann-Kasonin test in differential diagnosis of psychiatric disorders. It emphasizes the distinction between intelligence tests used as means of determining an "I.Q." and the same tests used as part of a well-rounded psychological description of the individual patient.

A New Plastic Orbital Implant

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and
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Medical Corps, Army of the United States

Recently designed and made available for use by ophthalmologists is an acrylic plastic implant which has many advantages over the old implants of glass, gold, or metal. Plastic is well tolerated by the orbit. As shown by figure 1, it would be extremely difficult for this implant to become displaced in the orbit or to "pop out" as often is the case with ball implants. The muscles are sutured to the implant in a manner to secure it firmly and to produce good movement, provided there is no pre-existing paralysis. A decided improvement in technique was made when, instead of looping the ends of the muscles over the device and then suturing them in a loop form, it was decided to split the muscle for 3 to 4 mm. and then tie the split ends together over the pulley of the device (figure 2). Where possible, when they were long enough, the superior and inferior obliques were also employed and sutured to the medial and lateral recti, respectively, to assist in movement.

The manufacturers of the implant also make the prosthesis of plastic, using a blown-up color photograph of the remaining eye as a guide. Numerous refinements are made, such as a lid elevator or shelf to hold the lid open in ptosis. The outstanding advantage is the ability to overcome the sunken, hollow appearance of the ordinary glass eye by building up, as the socket becomes accustomed to it, layer on layer of the plastic, so that the wrinkles and hollows are "ironed out." Dental technicians trained in the use of acrylics can do this, since the building-up process in no way affects the external appearance of the prosthesis itself. We suggested that a "pebble finish" be given the contact side of the shell to ensure good traction between it and the conjunctival surface covering the implant. Use of acrylics eliminates breakage, as the shell will not crack when dropped. Acrylic also has a low thermal activity.

The makers claim that the plastic has a healing effect on the tissues. We believe that their limited experience does not permit a positive statement in this matter, but the orbit appeared quite healed on the fifth or sixth day postoperatively. The black silk sutures used in closing the conjunctiva were removed at this time.

CASE REPORT

The patient, 28 years of age, an officer's dependent, at the age of 6 years fell on a lead pencil, perforating the right eye. The history is indefinite but she believes the eye was needled for the traumatic cataract. Apparently no effort was made to reposition the iris which became incarcerated in the wound and healed in this manner. We were unable to see the fundus on examination because of capsular fibrosis and thickening. The eye showed circumcorneal injection and a cloudy anterior chamber. Vision was restricted to light and dark in the eye; even gross movements could not be determined. Intense photophobia and lacrimation were present in both eyes. Vision o.s. was 20/400 without correction, correctible to 20/20 with —2.50 sph. = —2.50 cx 178°. There was no evidence of iritis and the fundus was normal.

The right eye was treated locally with atropine and hot packs. Sulfathiazole, 1.0 gm. every three hours, was given orally and bed rest in a dark room prescribed. She responded quickly with apparently complete recovery from the acute inflammatory process in four days. Three weeks later the right eye was operated on under pentothal anesthesia in a conservative manner and all remnants of the capsule were removed. The iridectomy was performed in the affected area and, aside from a slight loss of vitreous, which had become quite fluid, the operation was uneventful. The patient went home on the eleventh day postoperatively and a week later returned with the same complaint as at first. It was decided then to enucleate the right eye to prevent any progression of the process. We were primarily concerned with sympathetic ophthalmia, although there were no findings referable to the left eye except photophobia and lacrimation and the fundus remained unchanged. Two courses of penicillin 100,000 Oxford units each intramuscularly, three

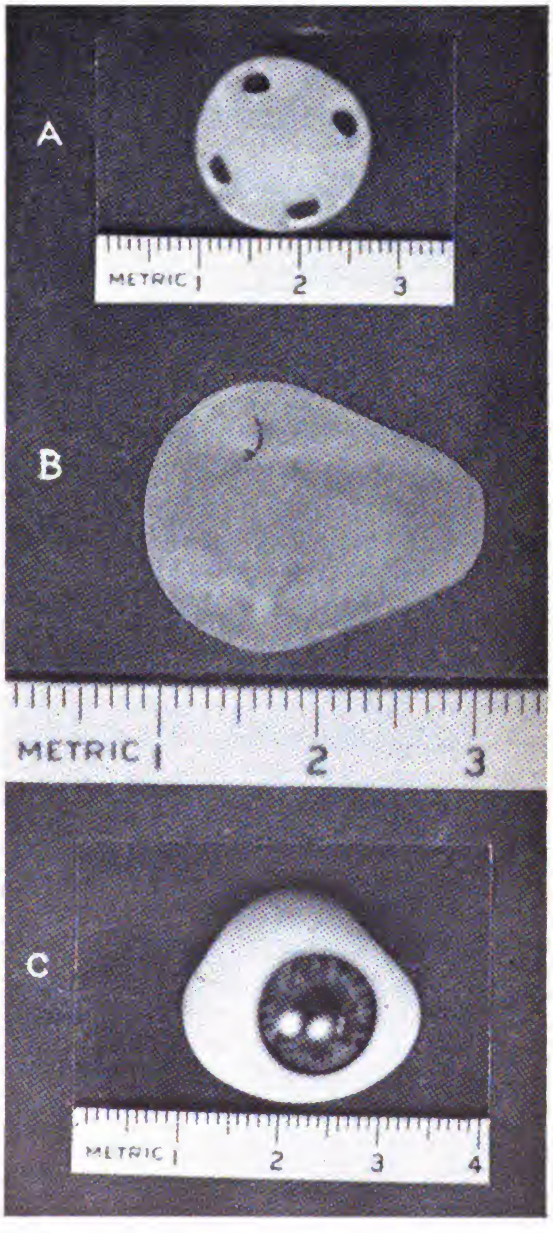

FIGURE 1. Plastic orbital implant. *A*, front view. *B*, side view. *C*, new plastic prosthesis. Army Air Forces photographs.

days apart, were given and the inflammation quickly subsided. One week after admission, the right eye showed a pearly gray deposit on the posterior surface of the cornea. Photophobia, lacrimation, and extreme sensitivity persisted in the affected eye.

Enucleation was performed under pentothal anesthesia. After circumcision of the cornea, the recti were isolated, cut, split, and tied. The superior and inferior obliques were also isolated. Then the enucleation was performed with preservation of as much of Tenon's capsule as possible. The ties were run through the plastic implant after hemorrhage was stopped, and the implant was then aligned in the orbit. The muscles were tied as described, including the superior and inferior obliques, and the conjunctival flaps closed. A pressure dressing was allowed to remain in place four days. The orbit was re-dressed on the sixth day and the sutures removed. No postoperative rise in temperature and no hemorrhage occurred. Fifteen days postoperatively the patient was fitted temporarily with a plastic stock prosthesis. Motility of the prosthesis is excellent, more closely approximating that of the normal eye than by any other method yet devised. The patient has suffered no discomfort since the usual temporary reaction following enucleation.

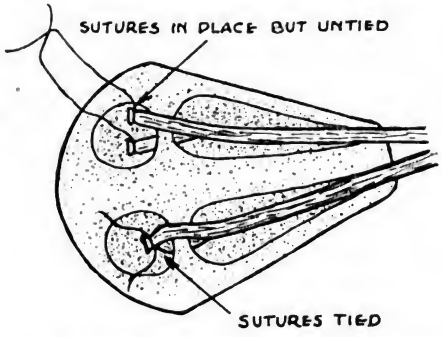

FIGURE 2 Method of tying split muscles to implant.

SUMMARY

A new implant of plastic and a new prothesis have been designed which are much more satisfactory in appearance and motility than any yet devised. A new technique of muscle suturing eliminates the nonviable end and gives greater strength and safety.

Cross-Connection Hazards in Military Hospitals

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The great Chicago amebic dysentery outbreak of 1933 was as famous in its way as the Great Chicago Fire of 1871. Both were deadly; both were preventable. Fire is more spectacular than the contamination of a drinking water system, but death and disease follow in the wake of both. Recent service command investigations of Army-leased and occupied hotels and A.S.T.P. facilities at colleges and universities show the need for cross-connection elimination surveys at these locations. Most of the newly constructed station and general hospitals have not been free of such hazards. In 1943 the Cross-Connection Committee[1] of the National Research Council, Medical Section, reported: "The dangers of back-siphonage pollution from hospital fixtures undoubtedly * * * exist in military hospitals."

1. See page 23.

In direct cross connections, the drinking water system is directly connected to a nonpotable pressure system (a contaminated cooling water system or a fire system) or to pressure-type fixtures or equipment such as sewage sump pumps or ejectors. In indirect cross connections, the connection is between the drinking water system and a nonpressure-type fixture, tank, or item of process equipment. In the direct cross connection, back siphonage or backflow may occur through open or leaking control valves or devices when the pressure on the nonpotable system is normally greater than that of the potable system or when the potable system pressure drops below that of the nonpotable system. Back siphonage occurs through an indirect cross connection when the pressure drops in the potable system and the location of a fixture is such that siphon action is set up between the nonpotable and the potable system; or when the pressure in the potable system becomes negative, resulting in a partial vacuum, and a flow, or even a lifting, of the nonpotable water into the potable supply. The possible result of such backflow from a nonpotable supply is easily visualized. Many people, however, have difficulty in understanding how contaminated or toxic liquids can flow into drinking water lines from flushometer valve toilets, submerged inlets to tanks, direct connections to sewers through process equipment, and other such indirect connections. "After all," they say, "aren't the drinking water lines always under pressure?" Unfortunately, "No," and therein, together with an underestimation of the force of atmospheric pressure, lies much of the difficulty in comprehending the dangers inherent to innocent-appearing indirect cross connections.

Low pressures and even negative pressures may frequently occur in drinking water systems and street mains. A broken street main may cause negative pressures in nearby mains and in the drinking water systems of buildings adjacent to the break. Similarly, large water demands by neighboring consumers or by fire engine pumpers may produce negative pressures within building water systems. A heavy water demand in one section of a building may, because of inadequate pipe capacity, cause negative pressures in other lines of the same building. And it is obvious what the pressure effect on the upper floors of a building is if a tap on a lower floor is opened *after* the water supply line to the building, or the street-main valve, has been shut off.

A list of the most common types of *direct* cross connections noted at military hospital installations follows:

1. Direct connections between drinking water lines and steam or hot water boilers through which steam or hot water may be forced back into the water line. Where such connections exist, personnel may be severely burned or scalded by the use of drinking fountains of flushometer valve toilets the sup-

ply lines of which had been filled with steam or hot water by backflow from boiler cross connections.

2. Direct connections between drinking water lines and boiler feed-water pumps and piping or connections to boiler feed-water treatment equipment through which concentrated chemical solutions may be forced into the drinking water system.

3. Direct connections between drinking water lines and sewage or cooling water pumps through priming lines or bearing lubricating lines.

4. Direct connections between drinking water lines and cooling water systems through which nonpotable cooling water may be forced into the drinking water lines.

5. Direct connections between drinking water lines and sewers, floor drains, and waste lines through the cooling jackets of refrigerator compressors, air compressors, and similar equipment. In the event of surcharge of the receiving sewers or drain lines and the occurrence of fluctuating or negative pressures in the water supply lines, backflow into the drinking water lines would occur.

6. Sewage treatment plants are frequent sources of dangerous cross connections and should be carefully checked.

All direct cross connections between drinking water lines should be eliminated by breaking the cross connection or protected by installing an approved-type backflow prevention device. When cross connections are broken, a free-fall air gap discharge of at least two pipe diameters should be provided. Approved backflow prevention devices are equipped with double-check valves. Some types in addition have a differential relief valve to dissipate any back pressure developing in the nonpotable system, and a vacuum breaker which will satisfy whatever vacuum may occur in the potable system.

Indirect cross connections most prevalent in military hospitals are enumerated below: These types of cross connections are often called "plumbing defects," because the method of installing the plumbing equipment has provided cross connections between the potable water lines and the waste water disposal.

As a rule, individual *indirect* cross connections are not so potentially hazardous as individual *direct* cross connections, for the reason that occurrence of a combination of factors must be simultaneous to produce back siphonage through them, whereas only one or two conditions must be "right" to produce backflow through a direct cross connection. It is well to remember that in the ordinary hospital installation indirect cross connections afford the greatest source of potential hazard by virtue of the total number of such cross connections and the lack of general understanding as to their potential danger.

Unprotected flushometer valve toilets and urinals constitute the greatest indirect cross-connection hazard in most military hospitals by reason of the number of such fixtures. When a negative pressure occurs in the supply line of a flushometer valve, the piston or diaphragm of the valve, depending on the type, is raised from its seat and thereby, through the discharge tail pipe, uncovers a direct channel connecting the toilet or urinal bowl and the drinking water supply pipe. Thus, if the bowl is clogged or has a high water level, the contents will be "sucked" into the water line. Contamination will enter the drinking water line even if the bowl is not clogged or does not have a high water level, for the air rushing into the supply line through the small holes around the bowl rim will carry, with it, in true aspirator fashion, considerable droplet contamination.

Submerged inlets constitute another large group of hazardous indirect cross connections. Their number and variety may be large even in a hospital of average size. Bedpan washers having submerged inlets are one extremely objectionable hazard of this type. However, submerged inlets to x-ray developing tanks, dental cuspidors, autopsy and specimen washing slabs and sinks, physiotherapy hydro-treatment units, laboratory sinks, slop sinks, dishwashing machines, steam tables, potato-peeling machines, bathtubs, and other miscellaneous equipment provide similar opportunity for contamination of drinking water lines by backflow. Laboratory and autopsy table aspirators frequently have the added hazard of an attached hose directly connecting the aspirators with the sink drains.

The backflow danger involved in the use of flushometer valves can be readily eliminated by the installation of an approved-type vacuum breaker, a small, inexpensive device which can easily be inserted in the flushometer valve supply line on the discharge side of the valve. All types of submerged inlets may also be protected by the use of suitable vacuum breakers, or the possibility of backflow may be eliminated entirely by raising the inlet above the rim of the fixture, thus providing a free-fall air gap discharge.

One other group of plumbing connections must be considered in hospitals, although such connections do not constitute cross connections in the accepted sense. These are direct and solid connections of drain lines from sterilizers, autoclaves, dishwashing machines, coffee urns, etc., to sewer or waste-water drain lines. To the ever-present hazard of sewage backing up into these fixtures because of surcharged sewer or drain lines, sterilizers and autoclaves have the further inherent hazard of negative pressures occurring within such units during the cooling period following sterilization. Instances have been reported where surgical equipment has been con-

taminated by wastes from the sterilizer drain line entering the sterilizer by virtue of the negative pressure developed during the cooling period.

All direct drain connections between hospital equipment and sewers or waste lines should be broken and air gaps of at least two pipe diameters provided in the drain lines. Special-type sewer or waste-line drain connections are available which combine the safety of an air gap with the advantages of a direct connection. These are particularly useful for sterilizer and autoclave drain line use, for they prevent the escape of exhaust steam into the atmosphere.

Intelligent cross-connection control is an essential part of any water supply program. To have concern only for the initial quality of the water as it enters the distribution system and to ignore the possibilities for recontamination of the water supply through cross connections is to do less than half a job.

The services of Sanitary Corps officers qualified as sanitary engineers (MOS 7960) should be utilized in the detection and elimination of these hazards. Hospitals and other stations not having such personnel may contact service command headquarters in regard to any problems of this nature.

Waldmann Vaccine for Foot-and-Mouth Disease in Liberated Italy, 1944

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The appearance of foot-and-mouth disease near Taranto, Italy, 26 May 1944, brought many requests from Italian veterinarians for vaccine (Waldmann) with which to immunize the more valuable breeding stock. Soon after the liberation of Rome, a veterinary laboratory was rehabilitated in that city for the specific purpose of producing this vaccine. Slaughter cattle from which the virus essential to vaccine production is harvested presented a serious problem, since the Rome area had been denuded of cattle. After some difficulty, cattle were shipped about 100 miles by rail to the Rome abattoir. These cattle served a dual purpose, since after the necessary virus of foot-and-mouth disease had been harvested for vaccine production, the meat was distributed to civilian hospitals in Rome, providing at that time the only available source of meat in any quantity. No illness attributable to the meat was reported.

Late in 1944, this laboratory produced and distributed 36,000 adult bovine doses of the vaccine. There has not been a reported incidence of the disease in any one of the 36,000 vaccinated animals. In Rome Province, 15,000 dairy cattle and

calves were vaccinated between 15 September and 15 October 1944. During the first week in November a herd of 280 nonvaccinated dairy cattle and calves centrally located in Rome Province became infected, with a mortality of 20 calves and 7 cattle. None of the 15,000 vaccinated animals has, four months later, reportedly shown any symptoms of the disease, though the infection was reported in six nonvaccinated dairy herds in Rome province up to 1 January 1945.

Immunity is not claimed until fifteen days after administration though there has been evidence that some immunity exists within one week. There are reports of herds in which infected animals were completely isolated and the remaining animals vaccinated, with very few vaccinated animals contracting the disease during the first two weeks following vaccination and no additional cases thereafter.

The recommended dosage of the vaccine administered subcutaneously is: adult bovines, 50 cc.; calves up to 220 pounds, 20 cc., 220 to 600 pounds, 35 cc.; sheep and goats, 5 cc.; swine up to 70 pounds, 5 to 10 cc., over 70 pounds, 15 cc. Revaccination every six months is recommended. The sites of injection are: cattle, in the lower third of the dewlap; sheep and goats, in the area corresponding to the lower third of the dewlap; swine, the inner surface of the flank fold. Much emphasis is placed on the importance of maintaining the vaccine at a temperature of 3° to 7° C. (37.4° to 44.6° F.) at all times. The expiration date is generally set at three months from date of manufacture. Most of the vaccine is administered to dairy cattle and calves where the more serious economic losses have normally occurred. Because of the voluminous nature of the vaccine, the limited production facilities, and the great difficulty in procuring slaughter cattle, the amount of vaccine which could be produced was extremely limited. Production of this vaccine in the Rome Italian Veterinary Laboratory goes through three phases: (1) harvesting and preparation of the virus; (2) preparation of the aluminum hydroxide solution; (3) manufacture of the vaccine.

PREPARATION OF VIRUS

A small quantity of virus is obtained from a naturally infected bovine with vesicular lesions by removing a small piece of lingual epithelium and placing it in about 100 cc. of a solution with pH 7.6 consisting of 50 cc. of glycerin, 25 cc. of a 0.235 percent bipotassium phosphate solution, and 25 cc. of a 0.90 percent monopotassium phosphate solution. This mixture is passed through a meat grinder with a fine plate and filtered through normal filter paper. About 0.5 cc. of the filtrate is placed just under the epithelium of the foot pads in each of three guinea pigs. Forty-eight hours later the pads of two guinea pigs showing lesions are placed in approximately 10 cc. of physiologic saline solution, ground, and filtered as above. The procedure of pad injection is repeated in three guinea pigs, all of which later showed lesions. The entire procedure is repeated a third time after forty-eight hours, resulting in a triple passage of the virus. The epithelium from the last three guinea pigs is placed in 30 cc. of the

glycerin buffer solution pH 7.6, ground finely, and filtered through normal filter paper. This virulent virus serves as a source with which to begin the harvest of virus for vaccine.

The Rome abattoir is equipped with durable restraining stocks located within a small building used only for the harvest of virus from slaughter cattle. Two susceptible cattle are placed under restraint within the stocks and 25 cc. of the virus solution diffused just under the dorsal lingual epithelium of each susceptible adult bovine, using twelve evenly spaced sites of injection from posterior to anterior. The importance of injecting some 7 to 8 cc. of this solution under the dorsal epithelium at the anterior tip of the tongue was strongly emphasized by the director of the laboratory in which the vaccine is produced. The reason given was that a much more copious supply of virus is later obtained from the tongue. Twenty-four hours later the bovine is slaughtered and the entire tongue removed. After washing the excess blood from the tongue with tap water, the entire dorsal epithelium and mucosa of the tongue is peeled off by hand, which is not difficult since the epithelium and mucosa are for the most part detached from the muscular portion of the tongue. The exposed muscular surface of the tongue and the detached tissue are both scraped with a long straight-edged knife. The lymph and virus obtained are put in a glass container, the detached tissue added, and the mixture placed in a freezer. When frozen solid, it is removed and passed through a fine meat grinder. Freshly distilled water in the amount of three to one is added, and this mixture is centrifuged for five minutes at 1,500 r.p.m. The liquid portion is drawn off, a quantity of distilled water equal to four times the original amount of virus tissue and lymph is added to the sediment, and the mixture is ground. Then once again this mixture is centrifuged, the supernatant fluid removed, water in the amount of four times the original virus tissue and lymph added, and the mixture ground. This washing of the virus tissue results in a more complete removal of the virus. The resulting solution of virus in the amount of eleven times the quantity of original virus tissue and lymph was first filtered through a Seitz size five then through a Seitz size six, "E.K." This is the finished virus solution ready for use in the manufacture of vaccine. A portion of it was used for inoculation of more cattle. A total of 600 bovines were inoculated as described above so as to obtain sufficient virus for the manufacture of 36,000 bovine doses of vaccine.

PREPARATION OF ALUMINUM HYDROXIDE SOLUTION

The preparation of the aluminum hydroxide is accomplished, to the point of placing the solution in the sterilizer, within two hours' time. This is emphasized as very important to successful vaccine production. The procedure for the preparation of 20 liters is as follows: (1) Twenty liters of water are warmed to 63° C. and 880 gm. of ammonium sulfate added. (2) To 4 liters of water, 1,500 gm. of aluminum ammonium sulfate are added, warming and stirring until all is dissolved. (3) The solutions of steps (*1*) and (*2*) are mixed, and two liters of cold ammonia added. (4) After 50 liters of water are added to the solution of step (*3*), the mixture is stirred for fifteen minutes and the liquid portion is removed by means of the centrifuge extractor. (5) To the sediment of step (*4*), 60 liters of water with 10 cc. of ammonia are added, the mixture centrifuged, and the fluid drawn off as in (*4*) above. (6) This washing is repeated five times. (7) The solid portion is collected in 20 liters of water, the mixture sterilized immediately at 105° C. for thirty minutes and allowed to stand for six days so as to permit maturation of the hydroxide. (8) The absorbing power of the hydroxide is tested as follows: When 4 cc. of the

hydroxide solution completely loses color following the addition of 80 cc. of a seventy-seven hundredth per thousand solution of Congo red (Merck 1340), it is considered satisfactory for vaccine production.

MANUFACTURE OF THE VACCINE

The vaccine is prepared by first mixing the following in the order mentioned: five parts, aluminum hydroxide solution; four parts, buffer solution; one part, virus solution. The mixing is accomplished in sterile metal cylindrical drums of 75-liters capacity. After adding the aluminum hydroxide and buffer solutions, a vacuum is produced within the container and the virus solution is slowly added while the mixture is agitated constantly. Following addition of the virus, the mixture is agitated for thirty minutes. Formalin is added to reach a concentration of one part in two thousand, so as to attentuate all virus not absorbed by the aluminum hydroxide, and the mixture is agitated an additional thirty minutes. The vaccine is then bottled under sterile conditions and stored at 25° C. for forty-eight hours. It is then placed in storage at a temperature of 5° C. for an additional ninety-six hours.

The buffer solution consists of 0.2 percent sodium hydroxide and 0.5 percent glycocoll solutions in such proportions that following the addition of four parts of the mixture as above, the pH of the vaccine is 9 to 9.2. The proportion ordinarily required is one part of the sodium hydroxide solution to one and seven-tenths parts of the glycocoll solution. The aluminum hydroxide, glycocoll, and sodium hydroxide solutions had been heat-sterilized, and the virus sterilized by passage through the Seitz "E.K." filter.

A safety test was made by injecting each of ten susceptible bovines with 60 cc. each. As the bovines exhibited no symptoms by the eighth day, the vaccine was distributed. No official potency test was made but the ten bovines inoculated in making the safety test were adjacent to naturally infected herds.

The procedure of vaccine production as described here varies somewhat from that described by Waldmann.[1] Basically the chief differences are as follows: (1) The bovines were not anesthetized, but slaughtered for human consumption prior to removal of the virus material. (2) The quantity of virus per dose of vaccine is slightly greater than Waldmann describes. (3) The virus tissue is washed three times instead of once as recommended by Waldmann. (4) The preparation of aluminum hydroxide and the kind and amount of buffer solutions, not described by Waldmann, are considered to be of importance.

CONCLUSION

Though the quantity of vaccine which could be produced was limited, it afforded assurance of a maximum amount of milk and dairy products to Rome and other populated centers at a time when such food was most essential. The psychological as well as the economic value of the vaccine was significant. There is every indication that the production and distribution in Italy of this or a similar vaccine for foot-and-mouth disease will greatly reduce the tremendous economic losses previously incurred from this disease.

1. Waldmann, O.: Report on Preparation of the Vaccine of Riems for Foot-and-Mouth Disease, presented at the Thirteenth International Veterinary Congress at Zurich-Interlaken, Switzerland, 21-27 August 1938. Published by Office International des Epizooties, Bulletin I, Vol. XVII, No. 2, September-October 1938, pages 282-283.

Trench Foot: The Diagnostic Value of "Ischemic Pain"

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During the past winter, a study of trench foot has been undertaken at this hospital, using the techniques commonly used in studies of peripheral vascular disease. While studying the reactive hyperemia response to vascular occlusion by blood-pressure cuff, a phenomenon was observed characterized by pain in the limb, presumably due to ischemia. This, we believe, is of some diagnostic value in trench foot. The procedure is simple and may be of some value in following the patient through convalescence.

Methods. The cuff of a standard sphygmomanometer is placed around the thigh of the patient, who lies flat in bed. The cuff is inflated to about arterial pressure. An arbitrary level of 220 mm. of mercury has been sufficient for all cases we have seen. The patient is then directed to describe his sensations in the part distal to the cuff. The period of time between maximal inflation of the cuff and the onset of symptoms is recorded. To carry out the procedure with exercise, the procedure is the same and the patient is instructed to dorsiflex and plantarflex the foot at the ankle at a rate of about twenty to twenty-four times a minute. Occlusion at rest or with exercise is terminated by deflating the cuff at five minutes or at the onset of pain.

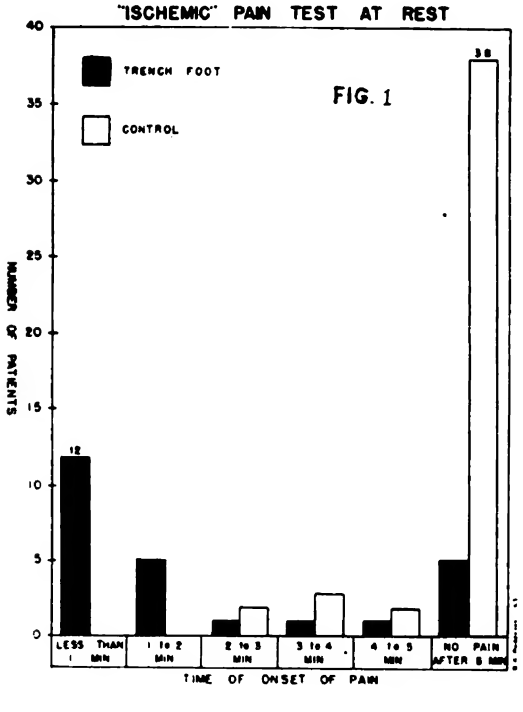

FIG. 1

Results. The reaction commonly seen in early cases of trench foot is that

of pain at the base of the toes along the metatarsal arch or along the longitudinal arch of the foot. The pain is described by these patients as a dull ache similar to that of a toothache. We believe the speed of onset of the pain is an indication of the severity of the trench foot. In the more severe cases, the pain appears after a very brief period of occlusion at rest, while in the milder cases the pain appears late at rest or only after exercise. In 25 cases of trench foot seen at this hospital, the response to vascular occlusion is charted in figure 1. It will be noted that 50 percent had pain at rest in less than one minute. Forty-five patients were selected at random from the medical wards and in this group of controls pain at rest failed to appear in 84 percent after five minutes of occlusion. Of the 7 control patients who complained of this pain at rest, 1 had had a mild case of trench foot three months before for which he had been hospitalized; 1 had a history of frostbite in civilian life; and 1 had many metallic fragments in the affected leg following the explosion of a detonator cap six months previously.

FIG. 2

LOCATION OF PAIN IN PATIENTS WITH TRENCH FOOT FOLLOWING VASCULAR OCCLUSION WITHOUT EXERCISE

In patients with trench foot, the pain elicited was usually located at the base of the toes in the region of the metatarsal or longitudinal arch of the foot. In the controls, the pain which was brought on chiefly by exercise usually appeared on the dorsum of the foot at the level of the malleoli and along the anterior surface of the lower leg. The pattern of pain is shown in figure 2 (patients with trench foot) and in figure 3 (the controls).

Several points are of value in evaluating the results obtained by this procedure. The patient is not forewarned that he will have pain. He is instructed only to describe his symptoms. It is advisable to wait five minutes between the procedure done at rest and with exercise. If the two procedures are done without the rest interval of five minutes, we believe sufficient reactive hyperemia remains and the results found after exercise may be obscured.

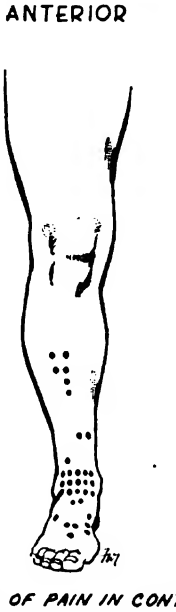

FIG. 3

LOCATION OF PAIN IN CONTROL PATIENTS FOLLOWING VASCULAR OCCLUSION WITH EXERCISE

As mentioned above, the location of the pain is important. With one exception, only patients with trench foot or patients with a history of previous trench foot or frostbite showed pain at the base of the toes in the region of the metatarsal or longitudinal arch of the foot. In the group over thirty-five years of age, there is a possibility that vascular insufficiency associated with advancing age may play a role. This pain is induced more commonly during exercise and the pain is usually in the calf muscles.

This procedure has been used as a diagnostic aid in patients admitted to the hospital for observation for trench foot. In several instances we have been able to say with assurance that the patient did not have trench foot. The patient was then returned to duty promptly without the period of observation which is usually needed to arrive at this conclusion. Patients with trench foot do not customarily remain for prolonged periods in a forward hospital, but in a few patients we have been able to correlate clinical improvement with increased tolerance to vascular occlusion.

The response obtained in a given individual remained constant despite temporary changes in the skin temperature of the foot. Thus, a patient will show a similar response when the feet are cold, when the feet have become warm spontaneously, and when reflex vasodilatation of the feet is brought about by oral alcohol or by warming of the body.

SUMMARY

A type of pain brought on by vascular occlusion is described, which is seen almost exclusively in trench foot. It is suggested that this pain is related to ischemia. It is believed that the severity of the local tissue damage in patients with trench foot can be correlated with the response to vascular occlusion. The procedure can be used to advantage in forward areas to determine accurately and promptly the diagnosis of trench foot. It is suggested that the term "ischemic pain" be applied to this phenomenon.

Great Men of Science.—Have you ever paused to consider why the Occident has, during the past two or three centuries, come to dominate the world? You may remember that at the time of Marco Polo under the great Khan of China there flourished a civilization more powerful and more refined than Europe could boast. Somehow there arose in the West the ardent desire to know. Henry of Portugal and Columbus of Genoa, following Polo's example, went out to explore the world. Leonardo and Francis Bacon and Galileo sought to learn the hidden nature of things that they might enlarge the bounds of human empire. Newton and Lavoisier, Franklin and Faraday, Henry and Helmholtz—these great men of science opened up a vast new world. They gave to Europe and America the steam power and the firearms that meant military might. They made possible the machines of industry which supplied the means of living to greatly increased populations. It is only very recently that the United States has taken a leading place in searching out nature's secrets; we were busy carving a nation out of the wilderness. (Science and Our Nation's Future, by Dr. Arthur H. Compton, Science, 2 March 1945)

March Fracture of the First Rib

(Barrack Bags Fracture)

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March fractures of bones of the lower extremities have been reported frequently, but no mention can be found in the literature of fractures of the first rib produced in a similar manner. Three cases of fatigue fracture of the first rib due to carrying barrack bags will be discussed in this report.

Fractures of the first rib are uncommon. The literature is meager and few attempts have been made to analyze the mechanism of their production. Breslin[1] was able to accumulate, after a search of the literature, 27 cases reported between 1869 and 1933 to which he added 5 cases of his own. Oldfield[2] reported one case of bilateral fractures of the first ribs and another case by Friedl. The cause of fracture was unknown in 10 of these cases and 21 cases were attributed to a single blow to the shoulder. The influence of muscle pull in causing the fracture was considered in 3 cases, a speculation which was later proved to be correct by Aitken and Lincoln.[3] None of these cases were diagnosed as fatigue fractures.

Ingersoll,[4] who summarized the recent conception of the causation of march fractures, states that "fatigue fracture" is a desirable term and that it denotes "all of those fractures occurring in apparently normal bone which seem to be due to the summation of microtraumata from repeated subfractural mechanical injury." The process is a gradual one involving continual rhythmical stress on the soft tissue supporting the bony structure. When the muscles, ligaments, and tendons lose their tone, the supporting function of these tissues is lost, allowing most of the stress to fall on the bone. When the bony structure

1. Breslin, Frank J.: Fractures of First Rib Unassociated with Fractures of Other Ribs, Am. J. Surg., 38:384-389, Nov. 1937.

2. Oldfield, M. Carlton: Bilateral Fracture of the First Rib, Brit. M. J., 2:839-840, 2 Nov. 1935.

3. Aitken, Alexander P., and Lincoln, Robert E.: Fractures of the First Rib Due to Muscle Pull, N. England J. M., 220:1063-1064, 29 June 1939.

4. Ingersoll, C. F.: Ice Skater's Fracture, Am. J. Roentg., 50:469-479, October 1943.

itself is fatigued, fracture occurs at a point where the stress is greatest. It will be shown that fractures of the first rib can occur under circumstances which conform with these principles.

CASE REPORTS

CASE 1. A 20-year-old, slightly built soldier, 70 inches tall and weighing 140 pounds, was marching in formation between two barracks spaced 150 yards apart. His two barrack bags were tied together and slung over his left shoulder (figure 1). After marching about 100 yards, he felt a sudden pain in his left shoulder and left upper chest. The pain was of such severity as to compel him to set the bags down. He completed the last 50 yards carrying the bags in his hands; this also caused pain in his left shoulder. Pain would recur in the left shoulder on any subsequent lifting with the left arm. A radiograph revealed an irregular separated fracture line in the mid portion of the left first rib (figure 2).

FIGURE 1. This photograph demonstrates the usual method of carrying barrack bags. Note how the left knee strikes the anterior bag when the left lower extremity is placed forward during marching. This rhythmic jar adds to the stress at the left shoulder. The arrows indicate the three lines of force applied to the left shoulder by the taut barrack bags ropes.

CASE 2. A 19-year-old soldier of asthenic habitus came to the cardiac clinic because of pain under the sternum and in the upper part of the chest. There was a history of rheumatic fever in childhood and, since the pain was greatly increased by marching, the integrity of the heart was in question. Clinical and electrocardiographic study failed to reveal heart disease but a most illuminating history was obtained. Some three and one-half months prior to this admission, this soldier had completed a short march of 150 yards. Two heavy barrack bags were tied together by the draw ropes and carried over the right shoulder. At the end of the march the soldier raised the anterior bag to place it on the upper of a double-decker bunk. The bag slipped through his hands and dropped about three feet, transmitting a sudden stress to a shoulder which, the soldier stated, was already much fatigued by the carrying of the two attached bags. The exertional pain described above began at once and continued in the pattern of coronary angina. The x-ray study revealed a heavily callused fracture in the middle of the right first rib.

Photographs by U. S. Army Signal Corps.

CASE 3. This 19-year-old soldier, 72 inches tall and weighing 137 pounds, had a fracture of the first rib, which was accidentally discovered on a radiograph taken during an attack of pneumonia. The fracture was heavily callused, indicating that it had occurred several months previously. This soldier had two episodes of carrying fully packed barrack bags on his right shoulder for a distance of 50 yards each time. The first episode occurred three and one-half months and the other, five weeks before the discovery of the fracture. These are the only incidents of trauma to his right shoulder that he could recollect. At no other time did he have any pain in his right shoulder even though he was required to lift heavy weights. The only positive finding was that his shoulder felt "tired at times." In all three cases the blood calcium, phosphorus, and phosphatase were normal.

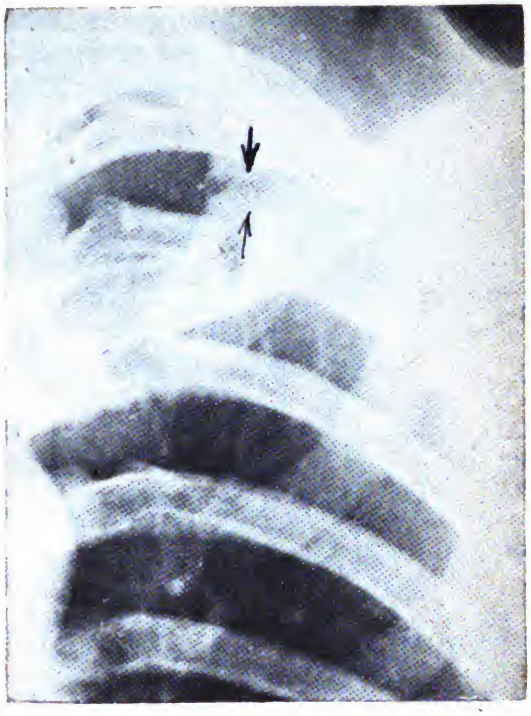

FIGURE 2. (Case 1) The gaping recent march fracture of the first left rib is illustrated on this radiograph.

DISCUSSION

Four factors are important in the production of march fractures: (1) the force applied; (2) the rhythm with which it is applied; (3) the total number of times it is applied; (4) the strength of the bones and the soft tissues involved.

By force is meant the extent of the individual subfractural trauma. In our cases, the force was applied by the compression action of a taut rope carried over the shoulder, to the ends of which were attached two 40-pound barrack bags. With each step the rope bounced slightly, the bounce being exaggerated by the slight kick given by the knee to the anterior bag.

Three lines of force are created by these taut barrack bags ropes: the first is transmitted to the first rib through the clavicle anteriorly by means of its attachment with the costal cartilage of the first rib; the second passes vertically through the soft tissues and clavicle at the superior surface of the shoulder; the third is directed from behind the shoulder against the posterior end of the first rib (figure 1). The forces in front and from behind, applied simultaneously, tend to bend the first rib in the anteroposterior direction. The vertical force, from above, eventually produces fatigue of the scaleni muscles which normally assist in the support of the first rib (figure 3). With

the suspensory action of the scaleni lost, the first rib will drop to the lowest point of its articulation with the transverse process of the first dorsal vertebra. When this state of muscle fatigue is reached, in addition to the stress placed upon the mid portion of the rib by its anteroposterior spring action, there is also a downward force at its anterior end creating a bending tendency at the point of greatest stress. These forces applied rhythmically to the shoulder will ultimately result in fracture of the first rib.

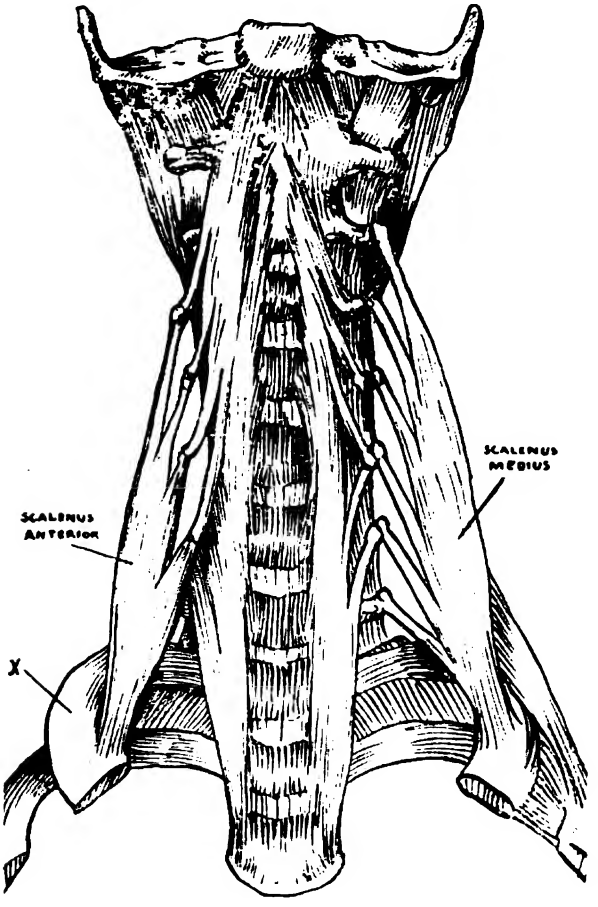

FIGURE 3. (After Gray's Anatomy) This diagram illustrates how the scalenus medius and scalenus anterior muscles arise from the transverse processes of the cervical vertebrae and insert onto the anterosuperior surface of the first rib thereby forming a "suspensory" for the first rib. When these muscles fatigue and their suspensory function is lost, the first rib drops to the lowest point of its articulating joint. The "jogging" force of the barrack bag rope over the shoulder will then produce a fracture of the first rib at the point X if the stress is maintained long enough.

Rhythm with Which the Force Is Applied

In march fractures of the lower extremity, the rhythm is determined by the regularity with which the marching is accomplished. The force is applied by the weight of the body and occasionally with the added weight of a pack. In fracture of the first rib, the rhythm is also determined by marching. In this case, jogging of the barrack bags with each step supplies the trauma. Slowing the rhythm of marching creates a longer span of time between the bounces, permitting greater recovery of the fatigued muscles and lengthening the time before the fractures occur.

Marching is accomplished in the Army with a definite and regular rhythm. Each step measures about 30 inches and about 120 such steps are taken per minute. While carrying barrack bags, the rate is reduced to about 100 paces per minute. In the cases described, one soldier marched 100 yards, the second 150

yards, and in the third the fracture occurred within 50 yards. Therefore, the first and second cases received about 120 and 180 rhythmic blows respectively, whereas the last case received a maximum of 60 blows.

The strength of the bone and its supporting soft tissues are pertinent factors in determining the amount of trauma required before a march fracture occurs. Fatigue fractures of bulkier bones with heavy soft tissue support, such as the tibia and femur, occur after sustained marches of 15 or more miles; in contrast, fractures of the fragile first rib with its relatively weaker soft tissue support, occur on marches of 150 yards or less. It is significant that case 3, the soldier with the most delicate physique of the three, required the least trauma to produce the fracture of the first rib. The physical characteristics of these individuals show a uniformity. The ages range from 19 to 20 years; the complexion is fair with blond or light brown hair; the height varies between 70 and 72 inches and the weight approximates 140 pounds.

DIAGNOSIS

The diagnosis of fatigue fractures of the first rib should offer no real problem. This history of sudden pain or tiredness in the shoulder following a march with barrack bags slung across the shoulder should place the medical officer on the alert.

Symptomatically this condition can be confused with cardiac lesions as was shown in the second case. Fatigue fractures of the first rib and cardiac conditions can both produce pain in the shoulder and upper part of the chest with radiation into the arm on lifting heavy objects. Lifting with the extremity on the affected side is productive of pain in fractures of the first rib; whereas, in cardiac lesions the pain can be produced by use of either upper extremity. The third case demonstrated that these fractures can be asymptomatic.

The fractured first ribs, in our cases, were best demonstrated by the routine posteroanterior radiographs of the chest. The standard anteroposterior projections of the shoulder girdle were also made, but in every instance the overlying clavicle prevented visualization of the fracture.

CONCLUSIONS

1. Fractures of the first rib can occur when the rib is subjected to rhythmical microtraumata of subfractural intensity.

2. Three cases of fracture of the first rib due to carrying barrack bags are reported. They conform accurately to the definition of march fractures.

Denture Repairs.—Denture repairs in continental United States varied from 3.23 to 4.59 per 1,000 men per month during the first nine months of 1944, while overseas the rates ranged from 2.24 to 2.66.

Intrapericardial Use of Penicillin

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and

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Acute pericarditis as a complication of meningococcemia, with or without meningitis, has been considered rare. Campbell,[1] in a review of 88 cases of meningococcemia, cites one case of pericarditis. Among 87 meningococcal infections at this station, 36 of which were accompanied by meningitis, pericarditis has been a complication in three cases. Penicillin administered into the pericardial space and intramuscularly was successfully used in a case of meningococcal pericarditis.

CASE REPORT

A white male, age 18, was admitted to the hospital in an unconscious state with generalized motor agitation. His temperature was 99.8°, pulse rate 72 per minute, the blood pressure 92 systolic and 70 diastolic. On the trunk and extremities was a moderate number of "old" dark brown petechiae and more recently formed red macular lesions, some of which had dark purple hemorrhagic centers. His neck was rigid, and the Brudzinski's and Kernig's signs were present. Except for these findings, the physical examination was negative.

The spinal fluid was cloudy and the cell count was 11,450 per cu. mm. Gram-negative intracellular diplococci were present. The white blood count was 26,450 per cu. mm., with 85 percent polymorphonuclear cells. Puncture smears from a skin lesion showed gram-negative intracellular diplococci. Cultures from the spinal fluid and the blood were positive for meningococci, which were identified by agglutination reactions.

Five grams of sodium sulfadiazine were given intravenously on admission and repeated in six hours. The patient regained consciousness eighteen hours after admission and sulfadiazine was continued by mouth, one gram every four hours, day and night.

During the first twenty-four hours, 3,000 cc. of 5 percent glucose in normal saline and 500 cc. of one-sixth molar sodium lactate were given intravenously. Urine voided twenty-four hours after admission contained many sulfadiazine crystals and five to ten red blood cells per high-power field. The blood sulfadiazine level was 13.2 mg. percent. Because of the urinary findings, sulfadiazine was replaced with sulfathiazole, 1 gm., and sodium citrate, 4 gm., every four hours.

1. Campbell, Eugene P.: Meningococcemia, Am. J. M. Sc., 206:566-576, Nov. 1943.

His general condition was good on the second day when the highest temperature was 99.4°. The third day the temperature was normal, but he complained for a short time of severe pain in left chest. Examination of the heart and the lungs was negative.

During the fourth day he became drowsy, and his neck was more rigid. The spinal fluid cell count was 2,120 per cu. mm. with 84 percent polymorphonuclears. The smears and cultures were negative. The blood sulfathiazole level was 6.2 mg. percent. The dose of sulfathiazole was increased to 1.5 gm. every four hours. The highest temperature the fourth day was 100.4°, but spiked to 102° on the fifth day; however, his general condition seemed to be improved.

The morning of the sixth day he complained of severe pain in the left chest, also of stiffness and pain in most of his joints. Examination of the precordial area revealed a thrill, systolic in time, a loud to-and-fro friction rub, and a gallop rhythm. A paradoxical pulse was evident but more readily detected by auscultation with a partially inflated blood pressure cuff. The liver was tender and palpable 6 cm. below the costal margin. The pulse rate varied from 104 to 120 per minute. The highest temperature on this sixth day was only 100.8° (rectally). An x-ray film showed moderate cardiac enlargement, and the electrocardiogram showed a pattern consistent with early pericarditis.

During the evening of the sixth day, the pain radiated to the left shoulder, the left side of the neck, down the inside of the left arm, and into the upper left quadrant of the abdomen. He was digitalized during the twenty-four hour period after the discovery of the heart findings and the enlarged liver.

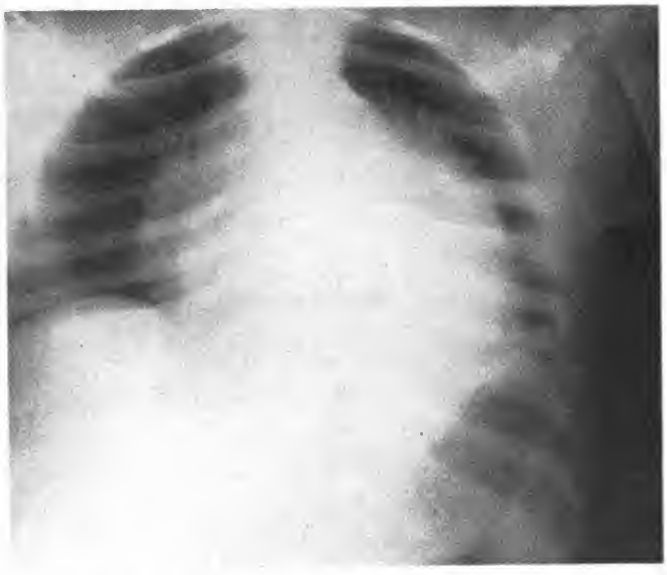

FIGURE 1. Roentgen ray film of chest taken on fifth day of pericarditis.

On the following day, the seventh, the findings were: increased respiratory distress, mild to moderate cyanosis, pulse rate of 110 to 124 per minute, and respiratory rate 40 per minute. The peak temperature was 102.6°. The blood pressure was 118 systolic and 70 diastolic, and the venous pressure (antecubital, recumbent) was 10 mm. of water. X-ray films exposed with the patient recumbent and in the upright position showed a further enlargement of the cardiac shadow with a wider base in the former position. These x-rays were interpreted as being diagnostic of a large pericardial effusion. An electrocardiogram was more typical of the patterns seen in cases of early pericarditis.

A pericardial paracentesis was performed on the seventh day, withdrawing 145 cc. of a slightly turbid, straw-colored fluid containing 490

cells per cu. mm., which were predominantly polymorphonuclears. A stained smear of the fluid revealed gram-negative intracellular diplococci. The sulfathiazole level of the pericardial fluid was 8.14 mg. percent (blood level previous day was 8.8 mg. percent). Following the paracentesis, the respiratory rate dropped from 40 down to 22 per minute.

A total of 53½ grams of sulfadiazine and sulfathiazole were given during the first six days. That the pericardial disease was still active, in spite of a pericardial fluid sulfa level of 8.14 mg. percent, was evident because of the increasing amount of pericardial fluid and the finding of gram-negative diplococci in the fluid. The case was considered to be sulfa-resistant. Penicillin therapy was started by giving 10,000 Oxford units intramuscularly every four hours.

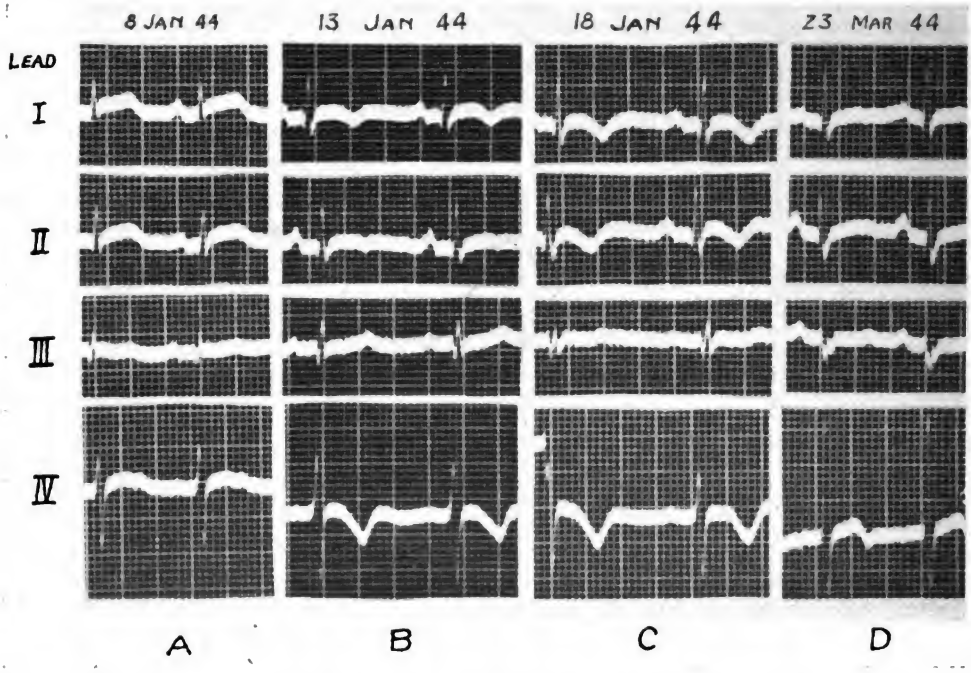

FIGURE 2. Electrocardiograms illustrating the serial electrocardiographic changes. A. Taken the fifth day of pericarditis, showing elevation and upward bowing of the S-T segments. B. Taken the eighth day, showing less elevation of the S-T segments, inverted T_1 and T_4, and slightly negative T_2. C. Taken the fifteenth day, deeply inverted T_1, T_2, and T_4, with low voltage of T_3. D. Taken the eighty-seventh day after onset of pericarditis, showing positive T waves in all leads with some deformity of S-T $_1$ and $_2$, and low voltage of T waves.

On the eighth day, the patient appeared to be critically ill; dyspnea and cyanosis were more marked and he was placed in an oxygen tent. The paradoxical pulse was more marked; the pulse rate 106 per minute, and the temperature 102.4°. An x-ray film (figure 1) showed further enlargement of the cardiac shadow. At 2:00 p. m., 430 cc. of amber, slightly turbid fluid were removed from the pericardium by the epigastric approach; this fluid revealed many gram-negative intracellular diplococci. The sulfathiazole level was 11.2 mg. percent. A culture of the fluid yielded meningococci,

identified by agglutination reaction. There was clinical improvement following the pericardial paracentesis. Ten thousand units of penicillin, in 10 cc. of saline, were instilled into the pericardial space at 2:30 p. m. the eighth day and repeated in ten hours.

Improvement was apparent the ninth day, although there were short intervals of left chest pain. An x-ray film showed a decrease in size of the heart when compared to a film which was exposed immediately following the removal of 430 cc. of fluid from the pericardium the day before. The paradoxical pulse was absent and oxygen therapy was discontinued. Gradual improvement continued with the temperature dropping by lysis, returning to normal on the thirteenth day. A total of 470,000 units of penicillin were given intramuscularly and 20,000 units into the pericardial space (chart 1). The patient remained afebrile and clinically well after the thirteenth day, although convalescent rest was continued for five weeks.

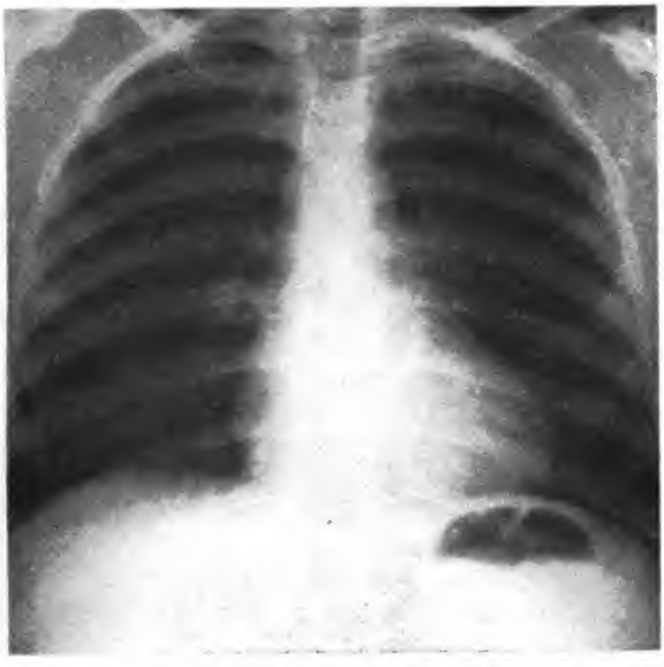

FIGURE 3. Roentgen ray film of chest taken seventy-seventh day after onset of illness.

The serial electrocardiographic changes were typical of the patterns seen in acute pericarditis (figure 2). It was demonstrated by teleroentgenograms that the heart shadow decreased in size rapidly. The heart was normal in size by the thirty-fifth day of the disease and remained normal, as shown by figure 3.

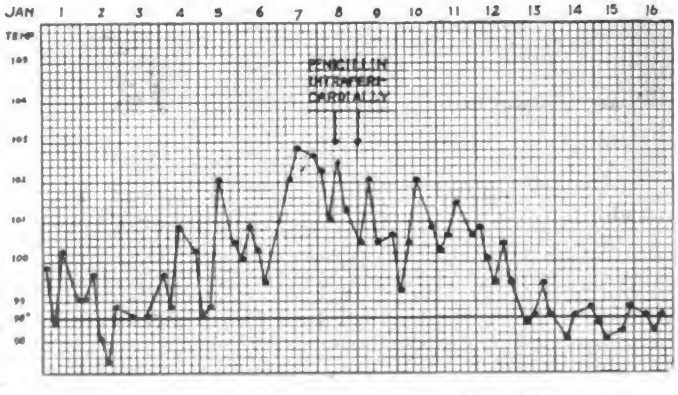

CHART 1. Temperature graph of a sulfa-resistant case of meningococcal meningitis and pericarditis treated with penicillin.

CONCLUSION

The intrapericardial and intramuscular administration of penicillin was successfully used in a sulfa-resistant case of meningococcal pericarditis.

Modification of the Eve Method of Resuscitation

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The adoption of the rocking method[1] of resuscitation by the Royal Navy has aroused much interest. In view of the success of the Schaefer technique used routinely in the United States, experiments were conducted and a method devised which, it is believed, incorporates the best points of both methods and represents an ideal technique of artificial respiration.

A folding trestle is attached to the sides of a standard Army litter. When opened and secured, the litter is supported on this "horse," fulcrumed as if it were an old-fashioned see-saw. One set of longer arms, stabilizing the trestle, extends above the horizontal level of the litter and represents the overhead fixed points from which pressure is applied to the chest by a reversed pulley action (figure 1). Attached bilaterally to the litter, about 12 inches anterior to the fulcrum point, is a set of sash-weight swivel pulleys. A pressure band, 5 by 12 inches, of heavy, padded canvas is attached by sash cord through the pulleys and the holes drilled in the extended arms and then secured to cleats along the lateral aspect of these extensions. Stops are present on the trestle to limit excursion of the litter to 30 degrees in either direction.

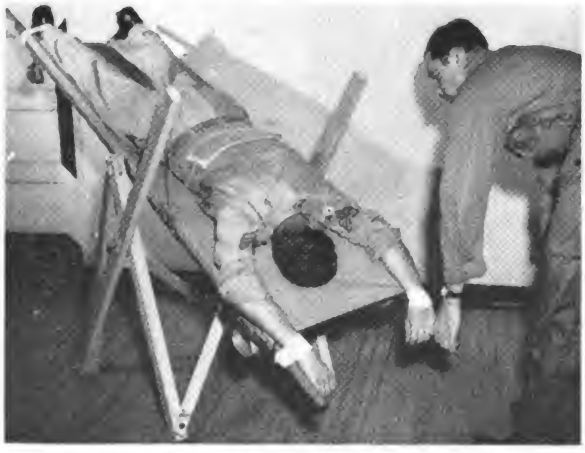

FIGURE 1

The subject is placed face downward on the litter, after loosening his constricting clothing, belts, collar, and necktie. His wrists and ankles are secured firmly to the litter handles with suitable strappings. With the head of the litter depressed slightly from the horizontal, the pressure band is adjusted snugly over the posterior lower thorax and the cord is threaded through the pulleys and holes in the extended arm and then fixed to the specific length by taking a few turns around the

Signal Corps photographs.

1. Eve, Frank C.: Resuscitation of the Drowned Today, J.A.M.A., 124:964-967, 1 April 1944.

fixed cleats. The head of the patient is turned to either side and his tongue pulled forward. The litter is now rocked up and down alternately 30 degrees to the horizontal at the rate of ten to twelve times a minute. With each downward motion the band automatically exerts a steadily increasing pressure on the thoracic cage at precisely that period when the diaphragm is being elevated by the weight of the intestines falling forward. At the same time, water and mucus are draining from the air passages, blood is flowing to his anemic brain, and the circulation through the heart is being forced by the column of blood in the lower extremities and abdomen.

On the reverse motion the pressure on the chest is quickly relieved by the relaxation of the pull on the band and, as the diaphragm falls downward, the lungs are given an opportunity to expand (figure 2). The circulation of the brain and medulla is maintained, and the heart again is furnished a volume of blood on which to contract by the column represented in the upper extremities and head.

FIGURE 2

The advantages of this method are: accessibility and ease of operation with no fatigue to the operator; pressure is equal, easily regulated, and maintained; massage with tonic effect on the cardiac musculature; compression of the thoracic cage at the exact time that the diaphragm is being pushed upward by the weight of the intestines; quick release of pressure on the thorax while the diaphragm is dropping, allowing for expansion of the lungs to their fullest extent; increased circulation to the brain with therapeutic effect on concurrent cerebral anemia (shock); easily improvised; ability to keep patient warm and dry by covering during resuscitation; easy transportation of apparatus (figure 3).

FIGURE 3

While the proposed device is based on a sound principle, attention should be called to the fact that the present standard Army litter is manufactured with round metal poles which require a somewhat different type of trestle attachment from that described by the author. The seesaw effect might be accomplished with less improvisation by using the standard litter with the field litter carrier (Med. Dept. Item No. 9917500). The small standard bellows type of resuscitator, which is more compact and permits more effective artificial respiration than the device described, would seem to be the apparatus of choice in any situation in which a special piece of apparatus could not be obtained for the emergency.—Ed.

"ARTIFACT SPIROCHETES" IN INFECTIOUS HEPATITIS

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In a recent outbreak of infectious hepatitis (catarrhal jaundice) among Allied military personnel in a foreign theater, 160 cases were studied and a search made for *Leptospira icterohaemorrhagiae.*

The blood of patients was examined by darkfield microscopy. The blood was allowed to stand under sterile conditions until the clot had retracted. The serum was centrifuged, and a drop of the sediment was examined. Filamentous forms from 7 to 20 microns long and 0.1 to 0.15 microns wide were seen in many of the sera. These filamentous bodies appeared to have knob-like ends. No spirals were observed in their structure, although occasionally a granular appearance suggested them. Their movement was passive; however, in the fluid under the cover slip their undulating motion was quite striking. Of all the specimens observed none were seen to move in a direction other than in that of the serum itself. When there was no stream of serum under the cover slip the bodies undulated about without actually moving across the field.

In 200 examinations of the blood of icteric patients the number of these filamentous structures in each preparation was counted. The findings were classified as "None found," or "1 to 9," or "10 to many." The results were as follows:

(A) Examination during the first 15 days after icterus appeared.

None found	20 examinations	17%
1 to 9	34 examinations	29%
10 to many	64 examinations	54%

(B) Examination covering a period of from 16 to 90 days after icterus (only 6 were taken more than 31 days after the appearance of icterus).

None found	23 examinations	28%
1 to 9	37 examinations	45%
10 to many	22 examinations	27%

In 50 similar examinations of the blood of afebrile surgical convalescents the following results were obtained:

None found	19 examinations	38%
1 to 9	29 examinations	58%
10 to many	2 examinations	4%

A group of 43 patients with varying degrees of fever (malaria, typhoid, paratyphoid, nasopharyngitis, pneumonia, and fever of undetermined origin) was examined.

None found	12 examinations	28%
1 to 9	15 examinations	35%
10 to many	16 examinations	37%

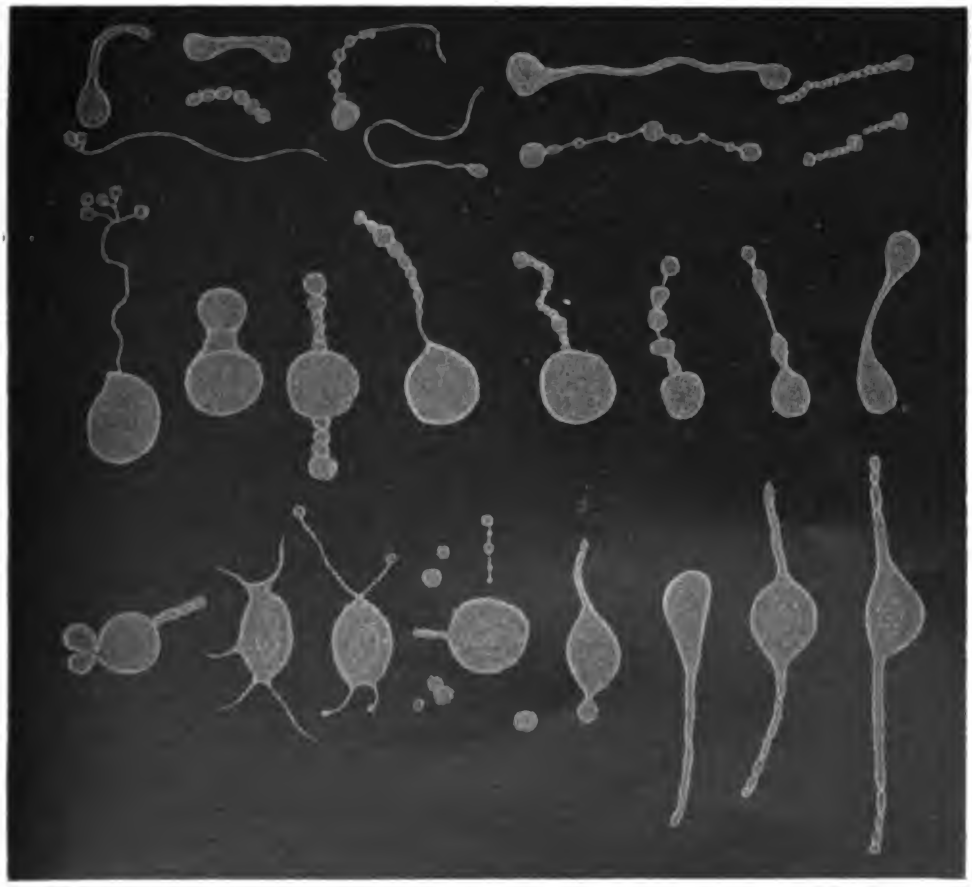
Five specimens of blood were examined from patients with fevers who developed jaundice in the next five days. Three of these showed "many" forms, one showed 3 forms, and the fifth showed "none."

The sediments of centrifuged urines from 50 patients at all stages of

infectious hepatitis, taken after the appearance of icterus, showed no forms resembling the filamentous bodies found in the blood.

Four guinea pigs injected intraperitoneally with the blood of seriously ill hepatitis patients showed no evidence of illness. The blood injected into these animals showed many filamentous bodies. One of the patients subsequently died, and sections from his liver resembled acute yellow atrophy.

Thin smears were made from the sediments of the centrifuged sera, which always contained a few erythrocytes. These smears were stained by



Artifact spirochetes. Appearances in blood under darkfield illumination, showing especially filamentous forms, resembling spirilla and leptospira derived from altered red cells. Not drawn to scale. (In part after Nuttall and Graham-Smith, from Andrew Balfour's Fallacies and Puzzles in Blood Examination, courtesy of Baillière, Tindall, and Cox, the publishers.)

the Giemsa and the Fontana-Tribondeau techniques. In none of the smears were any forms resembling *Leptospira* observed. There were, however, in these smears many erythrocytes the membranes of which had been ruptured. These torn membranes formed filaments varying from 5 to 20 microns in length and 0.1 to 0.3 microns in width. Some of these filaments were attached to the erythrocytes and some were detached. In the silver stains the filaments stained a light yellowish-brown and showed some small areas of dark brown to black pigmentation which gave the appearance of granules, although this phenomenon may have been due to twisting or folding of the filaments of torn membrane.

In the darkfield examinations of small drops of whole blood under the cover slip some of these undulating filaments were occasionally seen. These examinations were made in 46 instances on icteric patients whose centrifuged serum showed these forms. In 35 of these no filaments were seen. In 11, filaments were observed. These filaments in many cases were attached at one end to erythrocytes. In some instances they actually increased in length and broke free from the erythrocytes while under observation. After freeing themselves they moved about passively in the serum in the same manner as the forms described above. In these cases the erythrocytes were crenated and the filament appeared to be attached to one of the crenations on the cell. These whole-blood examinations also showed many filaments of fibrin running from one cell to another. Further, it was observed that if these preparations were allowed to stand at room temperature for several hours the number of filamentous forms tended to increase.

These filamentous bodies were called "artifact spirochetes." They have been described previously. Zinsser and Bayne-Jones noted: "A great many mistakes have been made by those unfamiliar with the appearances of blood, pus, and cultures under darkfield illumination in identifying as spirochetes wavy filamentous structures of heterogeneous origin. Forms extraordinarily like spirochetes are given off by red corpuscles in a drop under a cover glass (Schultz). Fibrin filaments may resemble spirochetes. Cilia (May and Goodner), bacterial flagella (Florence) and numerous pieces of cellular debris (Nägler) often have a deceptive spirochetal appearance. They can usually be distinguished from spirochetes by repeated *controlled* observations."[1]

Conclusion

The cause of increased incidence of "artifact spirochetes" in centrifuged serum of patients with infectious hepatitis was not determined.

[In a recent paper on this subject submitted through The Surgeon General's Office to the *Illinois Medical Journal*, Lieut. Colonel G. Howard Gowen, M.C., A.U.S., presented from North Africa the characteristics of pseudospirochetes observed in darkfield examinations of blood serum, from cases of infectious hepatitis before jaundice, with jaundice, and in cases that do not go on to jaundice. They apparently had no direct relationship to the degree of jaundice. The numbers present varied greatly in cases of similar severity and as the cases convalesced, these forms decreased markedly in number or disappeared. These artifacts were present in 11 percent of 176 blood sera from apparently normal persons. They were found also in guinea pigs injected with blood or serum from human cases of jaundice and also in normal guinea pigs as well as in injected and normal white mice. They were present in tame rabbits and in wild rats. This study led the author to believe that these free floating forms result from an extrusion of cellular contents of the red blood cells which extends into a filamentous form and subsequently becomes detached.—Ed.]

1. Zinsser, Hans, and Bayne-Jones, Stanhope: A Textbook of Bacteriology, pp. 687-688. New York: D. Appleton-Century Co., 1939.

SIMPLE METHOD OF X-RAY SERIALOGRAPHY

CAPTAIN JOHN W. TURNER
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Available materials can be used in the average Army hospital x-ray department to accomplish good serialographic studies. Sheet lead supplied as a standard expendable item can be carefully cut into flat, rectangular pieces of desired sizes and used for serialographic filming. Rapidly obtained multiple exposures of the gastro-intestinal tract are frequently needed. The problem of adequate visualization of the duodenal bulb in the absence of commercially manufactured fluorographic and serialographic equipment is a real challenge if one depends on random single exposures of the stomach as obtained on cassettes of 8 by 10 or 10 by 12 inches. Conservation of x-ray film, cassettes, and hangers and the optimum use of limited processing facilities are accomplished by serialographic studies. It is possible to compensate for equipment shortages in this manner, and time and manpower are saved in the work of processing films, first in the darkroom and later in the file room.

Technique

After an area of suspected disease is located by the routine fluoroscopic examination, the patient is placed on the table in approximately the desired position. A thin, rigid mat is then interposed between the patient and the table top, to be left in place until filming is completed. This mat can be constructed by mounting easily recognized pieces of lead on heavy cardboard (figure 1). The pieces of lead can be retained in place by adhesive tape. The L-shaped markers are so placed as to identify the center of the table top, and therefore the center of the cassette in its tray. These markers also define two corners of a rectangle 7 by 8½ inches. Two other markers between the two L-shaped markers in figure 1 indicate midlines of halves of the 7- by 8½-inch rectangle. The remaining two markers (figure 1) locate points 3½ inches from the midline of the table and thus further aid in aligning the desired object in an area 7 by 4¼ inches or 7 by 8½ inches by fluoroscopy. Lines are drawn to the edge of the cardboard mat to assist further in the alignment of the part centered with the appropriate area of the cassette.

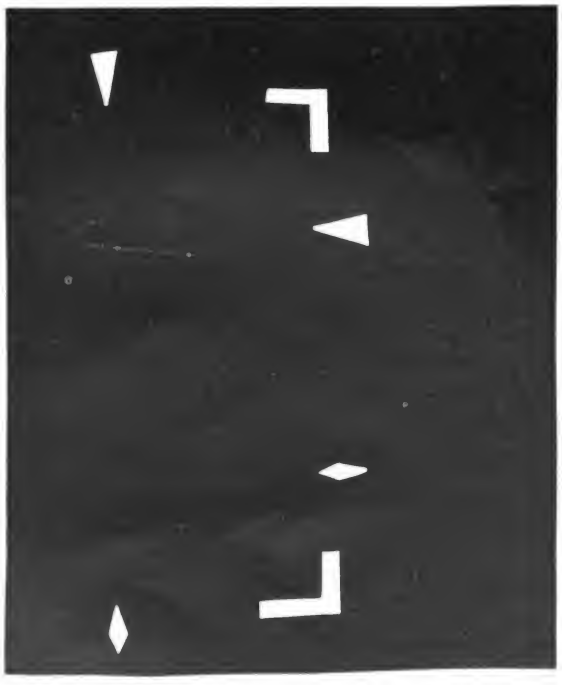

FIGURE 1. Reproduction of film to demonstrate lead markers which have been taped on heavy cardboard. These are mounted to show centering points for preliminary fluoroscopy and to identify midlines of rectangles 7 by 4¼ inches and 7 by 8½ inches.

The carefully flattened lead strips (figure 2) are placed on the cassette in the tray to occupy the space between the front of the cassette and the

Potter-Bucky grid. The strips can be rapidly shifted to expose desired areas. The metal edge of the cassette as shown in figure 2 is quite sufficient to serve as a guide channel for moving the lead strips rapidly and accurately. The cassette tray is pushed into its usual normal position, inasmuch as the tube is purposely centered 3½ inches from the midline of the table to coincide automatically with the predetermined object area centered from below by fluoroscopy, as already described. If eight exposures are to be made on a 14 by 17 cassette, the first four are made by aligning consecutive 7 by 4¼ rectangles of film with the object area as predetermined by fluoroscopy. After the first four exposures, the cassette is removed from the tray and rotated 180 degrees and the second four areas are exposed. Later, to facilitate viewing, the film may be divided vertically after drying and viewed as two 7 by 17 strips. If films are to be divided into strips, an identification marker should be shown on each strip of four exposures.

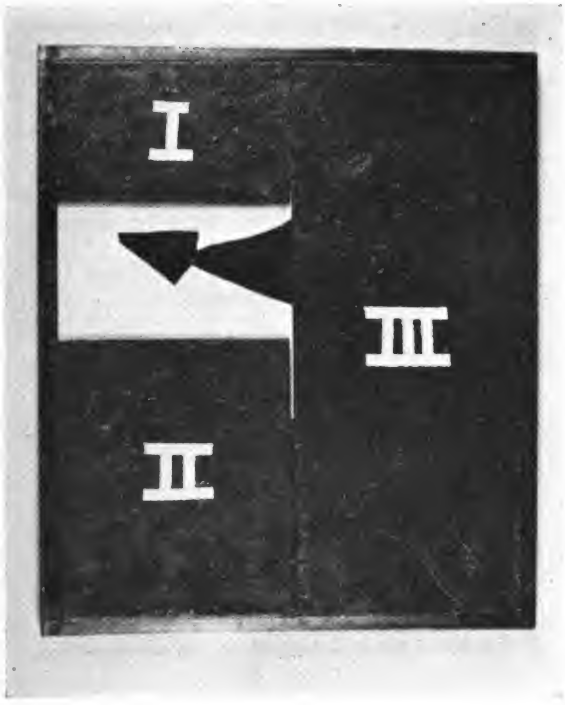

FIGURE 2. Rectangular lead strips in place retained in optimum positions by metal edge on front of cassette of this particular design. Schematic representation of duodenal bulb and pyloric area on one-eighth of cassette area. Lead strips as follows: I, 7 by 4¼ inches; II, 7 by 8½ inches; and III, 7 by 17 inches.

Serialograms of gastrointestinal structures are of greatest aid in the demonstration of the duodenal bulb and the stomach. Sections of the colon, particularly the cecal area, may also be filmed advantageously in this manner. Figure 3 shows completed serialograms as viewed in 7- by 17-inch strips. In addition to parts of the gastrointestinal tract, certain other structures can be filmed by interposing lead strips between the grid and film resting on the cassette as described. Four projections of the nasal accessory sinuses (patient horizontal) can be conveniently made on a 14 by 17 film. To facilitate centering, rectangles of 7 by 8½ inches are defined on the table top by nonopaque, colored cellulose tape. These rectangles are exposed by again centering the tube 3½ inches from the midline of the table. Other adaptations of the method include grid films of the femoral shaft, ribs. etc. Smaller film sizes can be similarly used by this method with lead strips of appropriate sizes for 8-inch and 10-inch cassettes. Since individual areas exposed are usually small, a cone is used with consequent additional gain in detail. The weight of the lead on cassettes does not impair screen-film contact and does in fact tend to place weight in such a manner as to oppose loss of this contact.

One precaution in connection with fluoroscopic centering of small areas preliminary to filming is that the part should be centered while the

patient is in the same phase of respiration as that in which films are to be made. In the routine gastro-intestinal examination vertical fluoroscopy may be accomplished first and supplementary supine and prone fluoroscopic observation can conveniently be made in conjunction with fluoroscopic centering.

Knowledge of the fact that several exposures are to be processed on a single film offers an added incentive to the technician to standardize his technique and to make films which are thoroughly amenable to the time-temperature method of processing. In this connection, availability for comparison of projections, e.g., sinuses, on a single film with identical processing gives the technician an excellent opportunity to compare technical factors and to build toward technical perfection.

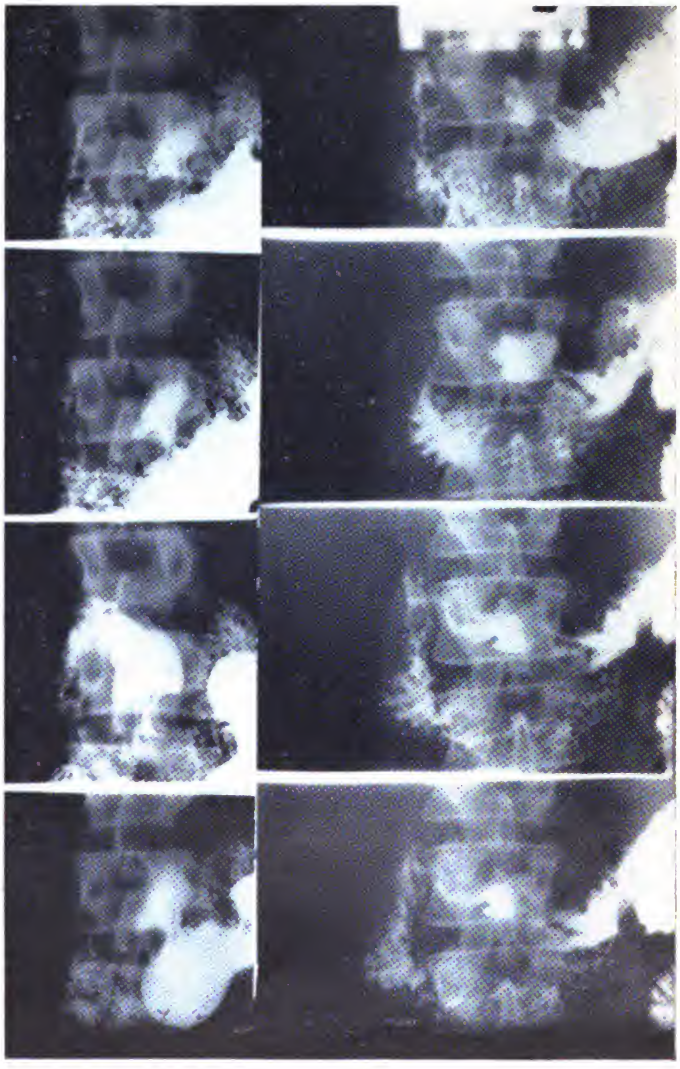

FIGURE 3. Film strips of 7 by 17 inches. Left, serialogram of normal bulb. Right, serialogram of duodenal ulcer.

AWARDS TO DENTAL OFFICERS

According to reports received in The Surgeon General's Office awards have been presented to twenty-six officers of the Army Dental Corps for the performance of outstanding service in this war. These awards include the Soldier's Medal, Legion of Merit, Silver Star, Oak-Leaf Cluster, Air Medal, Distinguished Service Star of the Philippines, Bronze Star, Distinguished Unit Badge, and Commendation for Exceptional Conduct.

DEVICE FOR MAKING PLASTER OF PARIS REINFORCEMENTS

CAPTAIN ROBERT K. HARVEY
Medical Corps, Army of the United States

FIGURE 1. Method of rolling a plaster splint. The right hand rubs the plaster and turns the drum in a direction clockwise to the operator.

In applying body or spica casts it is usually necessary to reinforce the circular plaster at critical points, and this is best done by means of plaster of paris reinforcements or splints, which may be made dry then soaked just before use or made as "reverses" with a wet bandage as they are needed. The latter process is slow and splints made in this manner are frequently wrinkled and cannot be used directly against the skin.

The use of a revolving drum on which to roll plaster reinforcements is not new. Henry[1] described an aluminum drum, which was turned with one hand by means of a handle while the other hand rubbed the plaster layers together. This device was apparently clamped to a table. Our device is more practical, as it is readily made in about two hours from salvaged materials, is more convenient as it rests on its own stand, and it does not require a handle.

The device consists of an empty metal drum—the container for 25 pounds of plaster of paris (Med. Dept. Item No. 2037200). The drum with its cover firmly fastened, is mounted on a horizontal axle in a light frame of ⅛-in. by 1-in. cold rolled steel. (The frame could be readily made of wood instead of steel.) A ratchet fastened to the frame and a pawl fastened to the drum, to permit rotation in one direction only, are shown on the photographs, although they are not essential if the frame holds the drum snugly. One or two ½-in. slots are cut

FIGURE 1. Cutting the splint from the drum. A knife, scissors, or cast cutter may be used.

This device was made at the author's suggestion, by Pfc. Harold Vezey of the Medical Detachment, Moore General Hospital.

1. Henry, M. O.: A Machine for Making Reinforcements for Plaster Casts, J. A. M. A., 94:559, 22 Feb. 1930.

through the side of the drum, to permit removal of the plaster.

A plaster reinforcement can be made rapidly with this device. The plaster bandage is held in the left hand; the right hand rolls the plaster on the drum, turns the drum, and rubs the layers of plaster together. The completed splint is cut off by a knife or scissors at one of the slots. With a few minutes' practice anyone can readily turn out smooth, neat splints. These are 36 inches long (the circumference of the drum) and may be folded lengthwise or end to end for various purposes. One 8-inch bandage, rolled on the drum and then folded lengthwise, is about the right size for a sugar-tong splint for the leg. Other uses will be readily apparent to the user of this device. The proper proportions and locations for splints, used alone or as reinforcements, are discussed in detail elsewhere.[2]

TRANSPORTATION OF PATIENTS ACROSS WATER

CAPTAIN MORRIS W. GREENBERG
Medical Corps, Army of the United States

To provide early transportation of the wounded across small deep bodies of water, a canoe can be improvised quickly out of materials usually available. The general principle has been used previously both by British and American troops.

The only materials necessary are a litter, tarpaulin of ¾-ton truck or larger, four Y-shaped branches of trees each about 2 feet long and 1½ inches in diameter for uprights and crosspieces, at least 50 feet of rope, cord, or roll of bandage, and an ax.

The litter is placed in the center of the tarpaulin upside down. The vertical uprights are about 1½ feet long and are notched about 2 inches from the bottom to fit into the handles of the litter to make this joint more secure. A bandage or cord holds this joint together. The Y-branches

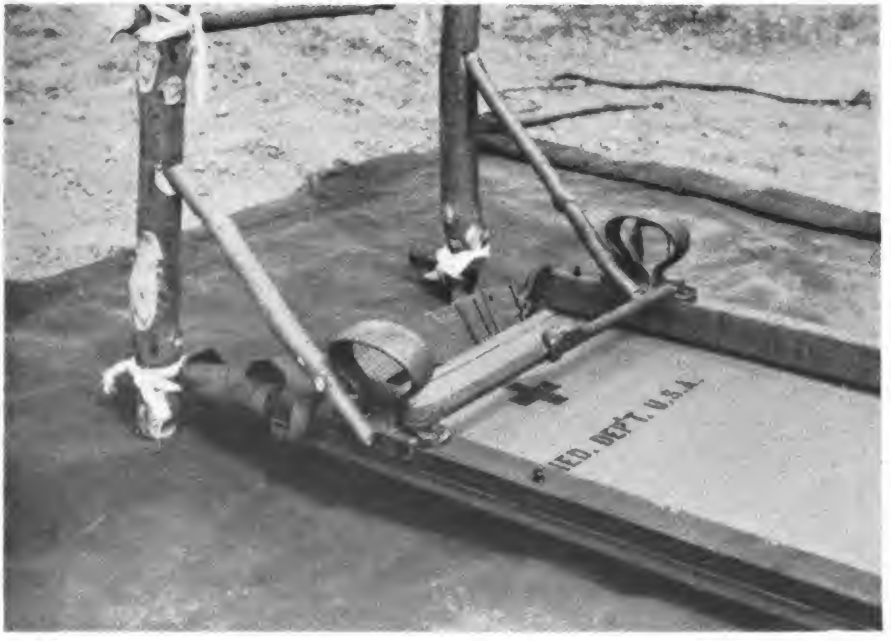

FIGURE 1. Construction of upright.

2. Luck, J. V.: Plaster of Paris Casts, J. A. M. A., 124:23, 1 Jan. 1944.

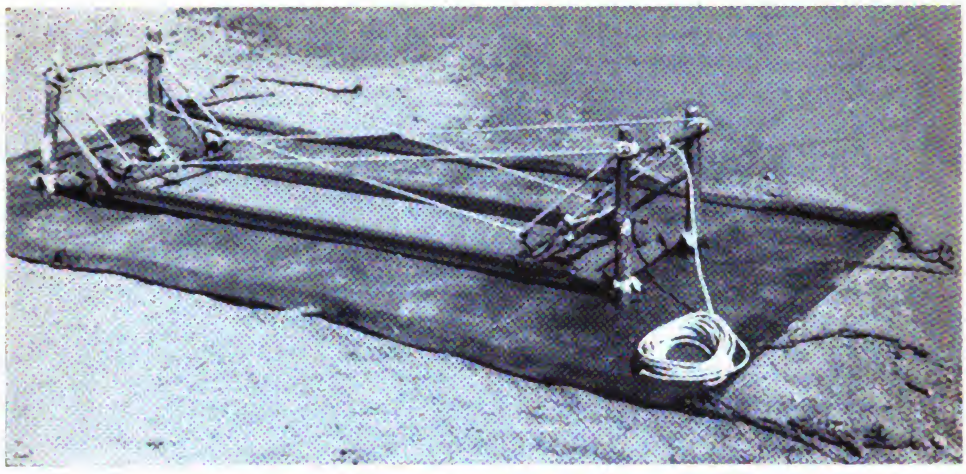

FIGURE 2. Frame complete with tow rope.

are fitted across the angles of the uprights and the litter handles with the Y locking into the stirrup and the other end fitting into a notch in the upright. A crosspiece prevents lateral motion of the uprights. It is best to notch this joint also and secure it by cord or bandage (figure 1).

The uprights are secured to the stirrups of the litter with rope as shown in figure 2. The next step is important to prevent sudden collapse of the litter crossbar. A length of rope fixes the litter crossbar to the constructed crosspiece of the frame.

A rope is then attached to the crosspiece of the uprights at either end to act as a tow rope (figure 2). The tarpaulin is then draped about this frame and secured by its own ropes (figure 3). The ends of the tarpaulin are folded before the sides. It is important that the corners be at the upper edge of the frame; otherwise, water will flow directly into the canoe through this flap. Then the sides are folded up and the entire tarpaulin held to the frame by an encircling rope (figure 4).

This canoe can easily transport a patient lying down. As it settles in the water only about 2 inches with one patient and 4 inches with two, it tips readily when the water is rough and when the patients are sitting up. To overcome this, two canoes are lashed together or two frames are cov-

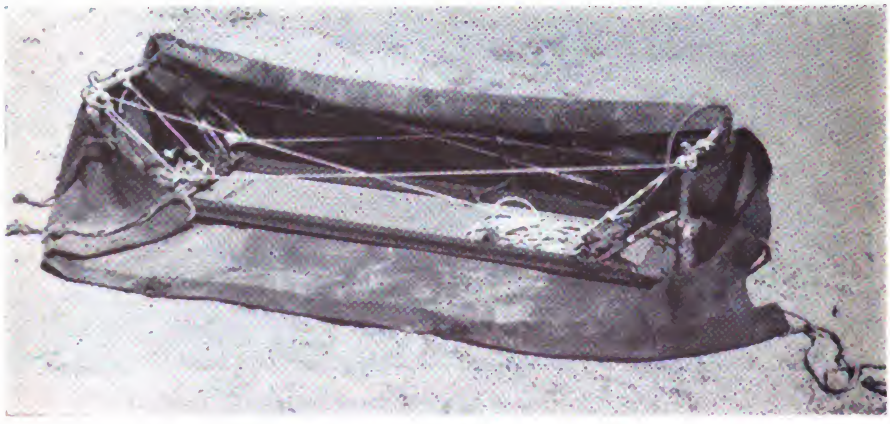

FIGURE 3. Folding the tarpaulin.

ered by a larger tarpaulin, with slats below to prevent sagging in the center. By using this principle and widening the lateral base with two or more frames, a substantially seaworthy canoe is obtained. With the materials on hand, the entire construction takes less than fifteen minutes.

FIGURE 4. Canoe completed.

COIL SPRING MULTIPLE DENTURE FLASK PRESS

CAPTAIN JOHN G. ETZKORN
Dental Corps, Army of the United States

The denture flask press is a necessary appliance for accurate processing of artificial dental prostheses, especially where acrylic resin base material is used. The camp dental laboratory had been using the standard Press, flask (Med. Dept. Item No. 5503000), in both medium and heavy sizes, but they frequently broke because of the pressure exerted on them and the large number of cases being processed. Several days elapsed before the post engineer machine shop returned the repaired presses, and our laboratory, during this time, had to resort to improvised methods or remain at a fabrication standstill during peak load periods. Also noted with this type of press were a number of dentures on which the bite had been opened and fractured during processing.

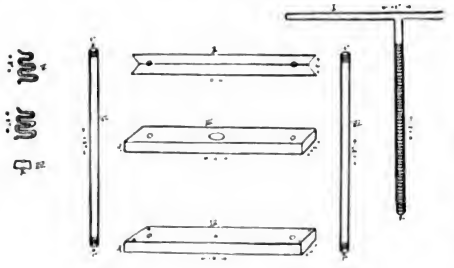

FIGURE 1

To overcome this difficulty, plans were drawn for a heavy-duty coil spring multiple flask press and submitted to the post engineer machine shop. Two presses were built and have been in constant use for five months.

Parts

The following parts (figure 1) used in the construction of this press were all steel reclaimed from salvage: I. The crossbar handle is 12 inches wide, welded to the threaded shaft which is 13 inches long and 1 inch in diameter. II. Crossbeam is 10 inches long, 2 inches in width, and ⅜ inch thick, with 1-inch-diameter holes drilled in each end, and one hole in the

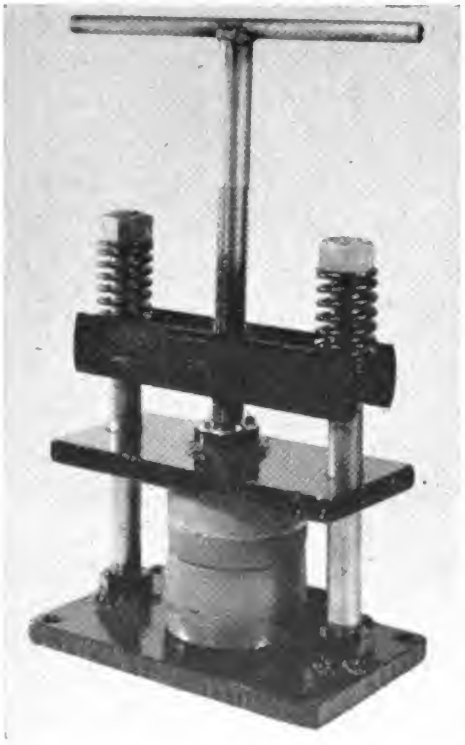

FIGURE 2

center which is threaded to accommodate the shaft of the crossbar handle. III. Upper table is 10 inches long, 4½ inches wide, and ¾ inch thick, with 1-inch holes on either side and a metal socket welded in the center to accommodate the convex end of the shaft of *I*. IV. Base is 10 inches long, 6 inches wide, and ¾ inch thick, with 1-inch bolts welded to each end, also four ¼-inch-diameter holes on the four corners to hold the bolts used to anchor the press to the workbench. Also there is a raised flange *A* in the center of the base to guide correct placement of flasks. V. Springs (from Chevrolet shock absorbers), 3 inches long and 1 inch inside diameter. VI. Rudders, 13 inches long, 1-inch diameter, and threaded at each end. VII. Bolts, 1-inch inside diameter.

Function

Two flasks are placed in flange *A*, on base *IV*, well-centered; crossbar *I* is turned, creating constant downward pressure on table *III* and upward pressure on crossbeam *II*. This starts tension on springs V, which controls equal distribution of pressure on the flasks.

Advantages

The spring tension closure results in an easy flow of the acrylic resin, which allows time for the acrylic resin to flow and completely fill the mold. Because of the easy flow of the acrylic resin, there is less chance for tooth movement "open bite" and fractured teeth. Complete closure of flasks results, again preventing "open bites." Constant repair of presses is eliminated.

Technique for Packing and Flask Closure

When the denture is waxed up and in proper articulation, it can be reproduced in acrylic resin so that the teeth will be held in their true relationship; that is, the articulation will be maintained. The tooth relationship can be changed by improper packing and closing of the flask.

The following points should be remembered in closing a denture flask: The case should be trial-packed. The excess should be trimmed off after each closure. The bench press should be screwed down slowly; perferably move the screw down until a slight resistance is felt, wait for a short time (one minute), then tighten some more until the resistance is felt again, repeating this process until no more flow is obtained. For the final closure, be sure that the two halves of the flask are in metal contact. Place the flash in a spring clamp for curing. Set the clamp so the spring can compress when the resin expands during heating. In other words, close the spring on the compress to its maximum, then back the spring one-half turn. This slow closure of the flask allows time for the resin to flow and completely fill the mold. When the press is quickly closed under heavy pressure, the teeth will be forced down into the investment, resulting in the "open bite" condition.